MINING WORLD

JULY 1960

SHAFT SINKING project at Christmas Mine proceeds on schedule ▸ 28

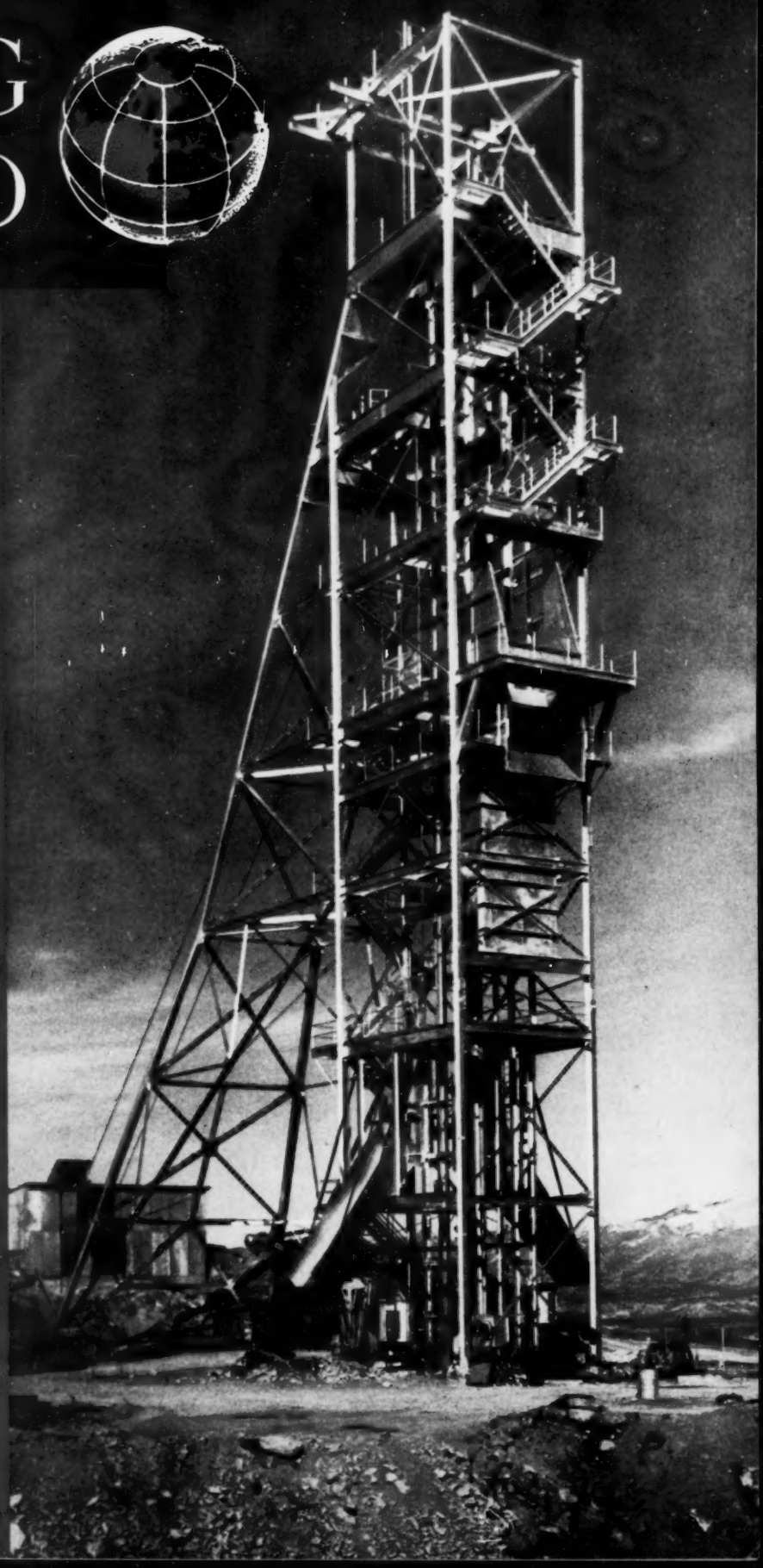
ALSO IN THIS ISSUE

Drainage problems solved at Ambrosia Lake ▸ 30

Wet screening eliminates ore drying ▸ 34

Corkscrew adit at Tri-State Zinc Mine ▸ 36

New dredging ideas from South America ▸ 39



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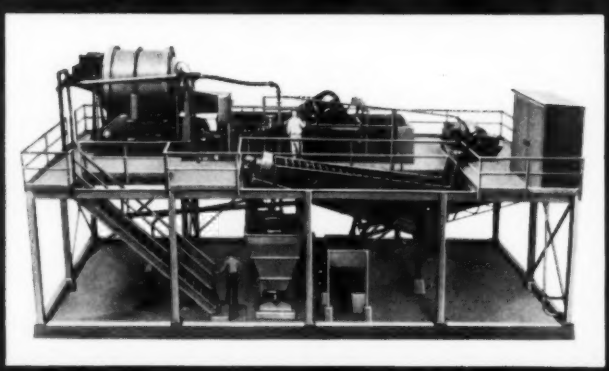

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  In most cases, fatigue failure starts from the point where corrosion has set in. In other words, corrosion sets up the conditions for a fatigue break to occur. Except—when you use Sandvik Coromant Integral Steels! The exclusive Sandvik SR-treatment* protects against corrosion and provides from 30 to 50% longer life than untreated steels.

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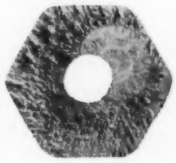

Appearance of a fatigue breakage that often arises with rods that have not been protected against corrosion. Sandvik's SR-treatment* protects against such failures.

*pat. pend.

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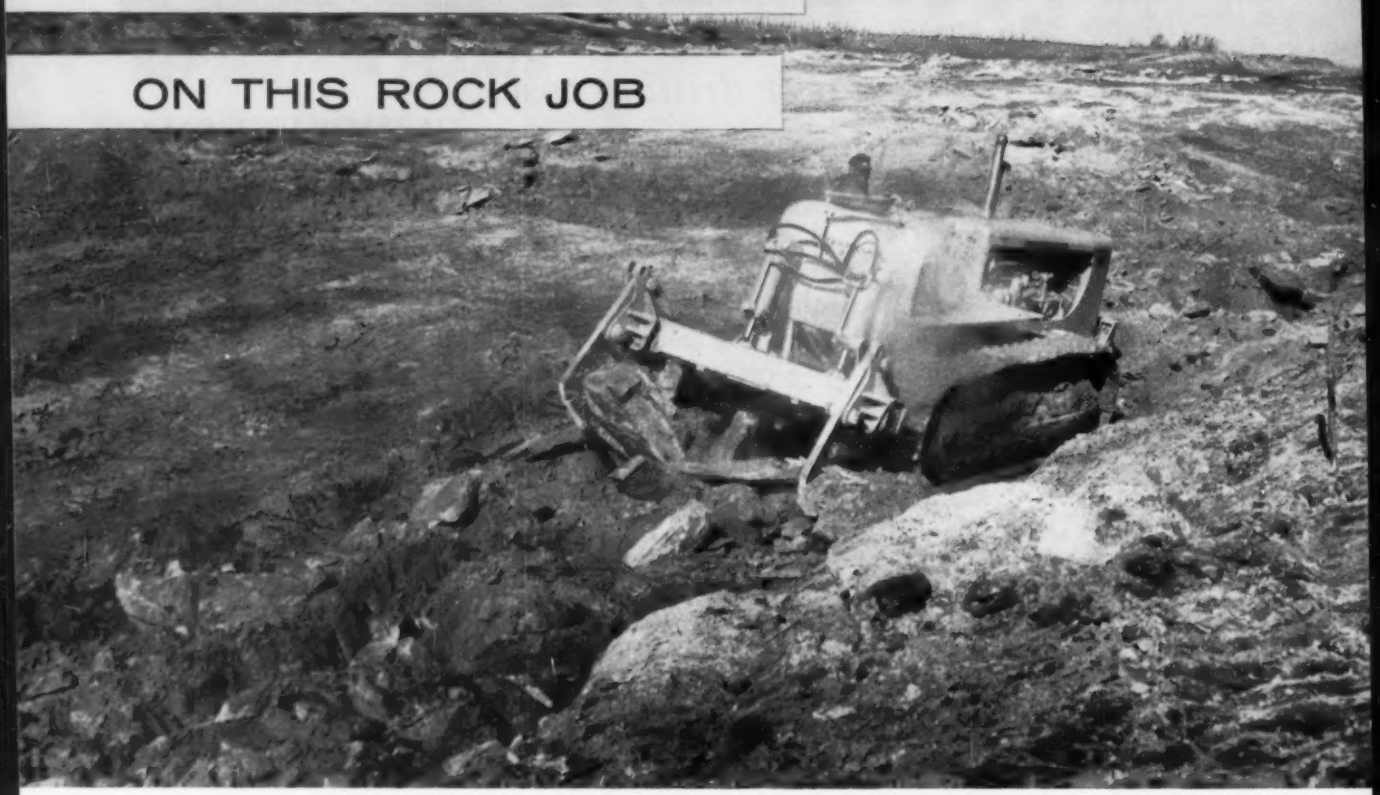
"FIRE IN THE HOLE"

A FORGOTTEN PHRASE

ON THIS ROCK JOB



If there's any yelling it's probably about the savings of ripping the rock rather than drilling and blasting.

This is Lee and Fox's job, U. S. Route 276 in Laurens County, South Carolina. They had to remove 70,000 cu. yd. —a large portion of it rock.

And that's where their D8 and No. 8 Ripper took over. The rock was torn up and shattered into pieces small enough to be loaded out in scrapers. That means *big* savings.

This one job isn't the whole story by any means. Just take a look at cost savings on different jobs, different materials, all over the country. (See chart at right.)

With the new heavy, powerful Caterpillar track-type Tractors and modern rippers, costs run about 35% to 60% of blasting costs — sometimes even as low as 11%! And there are more savings than that . . . a ripper shatters the material small enough that it can be loaded out with scrapers rather than with a shovel and trucks or wagons.

For a complete story on the economics of ripping see your Caterpillar Dealer. He knows the dollars and cents of ripping; he has the quality earthmoving equipment for your job. Ask for a demonstration.

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COST RELATIONSHIPS OF TYPICAL JOBS

Location	Material	Ripping Costs (Cents/Cu. Yd.)	Drilling and Blasting Costs (Cents/Cu. Yd.)
Tulsa, Oklahoma	Limestone	7.3	17.3
Dallas, Texas	Limestone	5.2	15.1
San Francisco, Calif.	Sandstone	15.0	30.0
Merriam, Kansas	Sandstone	2.1	11.7
Nelsonville, Ohio	Sandstone	5.7	13.8
Philadelphia, Pa.	Limestone	11.5	19.3
Carbo, Virginia	Sandstone	8.6	15.7
Hibbing, Minn.	Frost	25.0	60.0
Hibbing, Minn.	Paint Rock	6.1	54.5

The new D8 SERIES H—a modern track-type tractor giant. NEW turbocharged D342 Cat Diesel Engine—235 HP (flywheel). BIG—47,000 lb. operating weight. New 84" track gauge, new undercarriage. New common lube system for transmission, bevel gear and steering clutches. Power shift transmission optional.

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MINING WORLD

. . . . . including the Export Edition, WORLD MINING

VOL. 22 NO. 8 July 1960

Christmas Mine Development of Inspiration Consolidated Copper Company in Arizona proceeds at fast pace with sinking of McDonald shaft 28

Ambrosia Lake Uranium miners solve problems of mine drainage and raise tonnage to 235,000 per month 30

Wet Screening of coarse wet ore by new method from Finland completely eliminates the need of ore drying prior to processing 34

Unusual Corkscrew Adit at Bowers-Campbell zinc mine in Virginia develops ore to 700-foot depth. Diesel haulage keeps costs down 36

Colombian Gold Dredges boost capacity with high-speed bucket lines and feature manual control of a. c. hoist at South American placer operations 39

Far East Mining and Milling practices are described by MINING WORLD Editor George A. Argall, Jr. who gives a first-hand report direct from Tokyo and Manila 44

WHAT'S GOING ON IN MINING

Southwest 58
Rocky Mountain 60
Central States 57
Eastern States 57
Iron Ranges 57
Northwest 62
International 65

DEPARTMENTS

Drifts and Crosscuts 5
Capitol Concentrates 7
Production Equipment Preview 47
Metal and Minerals Prices ... 54
Advertisers' Index 82

MILLER FREEMAN PUBLICATIONS

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Sturtevant Construction Assures Long Mill Life at Top Loads

Sturtevant crushing and grinding machinery answers the long life top-load production problem for medium to small size plants. Many Sturtevants have been operating above rated capacities for more than 25 years, and *without a major repair.*

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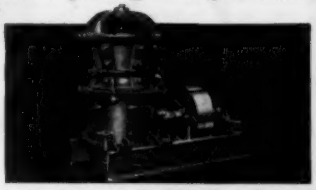
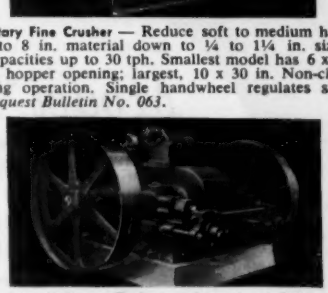
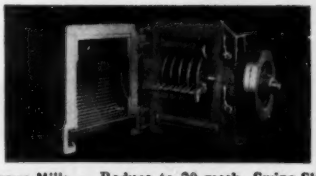
Jaw Crushers — Produce coarse (5 in. largest model) to fine (⅛ in. smallest model). Eight models range from 2 x 6 in. jaw opening (lab model) to 12 x 26 in. Capacities to 30 tph. All except two smallest sizes operate on double cam principle — crush double per energy unit. *Request Bulletin No. 062.*



Rotary Fine Crusher — Reduce soft to medium hard 3 to 8 in. material down to ¼ to 1¼ in. sizes. Capacities up to 30 tph. Smallest model has 6 x 18 in. hopper opening; largest, 10 x 30 in. Non-clogging operation. Single handwheel regulates size. *Request Bulletin No. 063.*



Crushing Rolls — Reduce soft to hard 2 in. and smaller materials to from 12 to 20 mesh with minimum fines. Eight sizes, with rolls from 8 x 5 in. to 38 x 20 in.; rates to 87 tph. Three types — Balanced Rolls; Plain Balanced Rolls; Laboratory Rolls — all may be adjusted in operation. *Request Bulletin No. 065.*



Hammer Mills — Reduce to 20 mesh. Swing-Sledge Mills crush or shred medium hard material up to 70 tph. Hinged-Hammer Pulverizers crush or shred softer material at rates up to 30 tph. Four Swing-Sledge Mills with feed openings from 6 x 5 in. to 20 x 30½ in. Four Hinged-Hammer Pulverizers with feed openings from 12 x 12 in. to 12½ x 24 in. *Request Bulletin No. 084.*

**Reports Manager W. Carleton Merrill concerning Sturtevant Swing-Sledge Mill at James F. Morse Co., Boston.*

STURTEVANT MILL COMPANY
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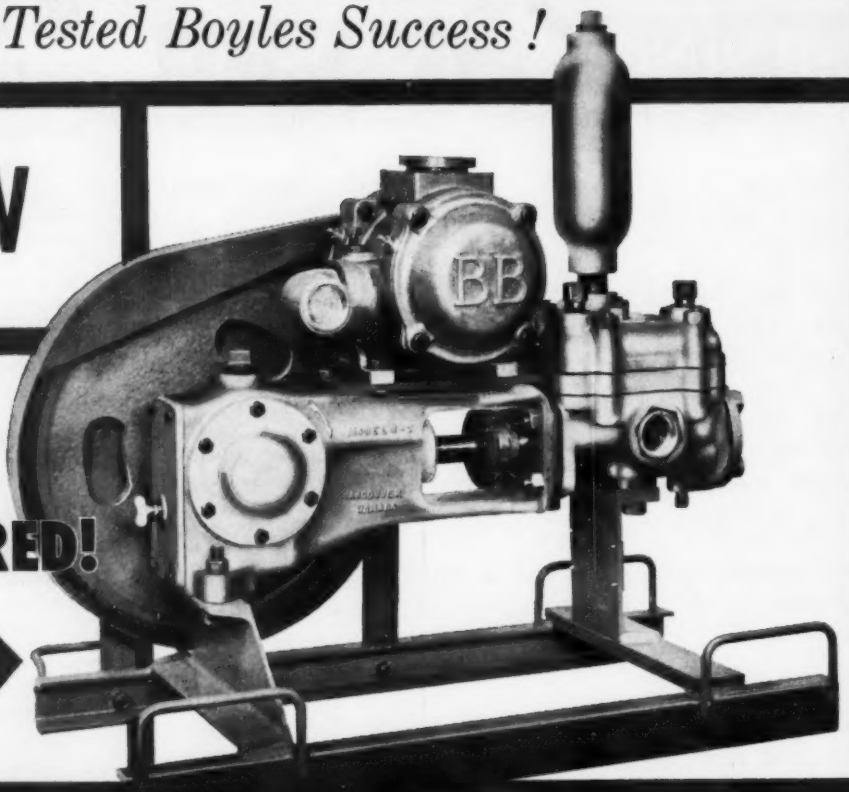

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For full details write your nearest office for Bulletin #185.

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Editor ..... George O. Argall, Jr.
Field Editor ..... John R. Bogert
News Editor ..... Janet M. Taylor
Assistant News Editor ..... L. B. Robinson
Product Editor ..... Suzanne Matsen
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Circulation Manager ..... C. C. Baake
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New York City Office
370 Lexington Avenue
New York 17, New York
Murray Hill 3-9295
District Manager ..... Stanley H. Dayton

Director, International Operations .....
Ralph R. David

Chicago Office
1791 Howard Street
Chicago 26, Illinois
Rogers Park 4-3420
District Manager ..... Norman C. Ek

Vancouver, B. C. Office
402 Pender St. West
Vancouver, British Columbia, Canada
MUtual 5-7287
Cable Address: MILFREEPUB
Associate Editor ..... Charles L. Shaw

United Kingdom Office
130 Crawford Street
(Corner Baker Street)
London, W. 1, England
WElbeck 3624
Cable Address: MILFREEPUB
Manager, United Kingdom Office .....
Bernard W. Lansdowne
Advertisement Manager ... Derek Hopkins

Continental European Office
28 Attendorner Street
Köln-Merheim
West Germany
Telephone: 87-17-52
Cable Address: MILFREEPUB
Director, Continental European Operations
Dr. Walter F. Vogenc

STAFF CORRESPONDENTS: Africa—Johannesburg, Union of South Africa; Salisbury, Southern Rhodesia; Luanshya, Northern Rhodesia; Kampala, Uganda. Asia—Ankara, Turkey; Kuala Lumpur, Malaya; Bombay, India; Tavoy, Burma; Karachi, Pakistan; Seoul, Republic of Korea; Tokyo, Japan. Europe—London and Redruth, England; Vienna, Austria; Stockholm, Sweden; Trondheim, Norway; Paris, France; Madrid, Spain; Köln-Kalk (Cologne), West Germany; Rome, Italy. North and Central America—Vancouver, British Columbia; Mexico, D.F., Mexico. Oceania—Port Kembla, Australia; Manila, Republic of the Philippines; Bandung, Indonesia. South America—Lima, Peru; La Paz, Bolivia; Buenos Aires, Argentina; Santiago, Chile; La Serena, Chile.

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Staff World Travel

Remember when isolationists reigned supreme and many people in the United States thought that this country could simply crawl into a shell and let the rest of the world take care of itself? Maybe isolationism was popular once, but we certainly can't ignore the things going on about us today.

World travel and trade have become almost as popular as the so-called nickel cup of coffee (if it ever existed). The rest of the world has learned a great deal from us, and maybe it's time that we learn something from the rest of the world.

These are some of the drives that lie behind editor George O. Argall, Jr.'s trip in the Pacific, where he visited Japan. The Philippines, Australia and the Fiji Islands. They also account for Hanry G. Grundstedt's current trip that will be taking him to Sweden, Germany, France, and the United Kingdom.

We've already demonstrated in the pages of MINING WORLD and WORLD MINING that the Scandinavian mines are models of efficiency and have developed many ideas that we can use over here to good advantage. The same is true of our friends in the Pacific. George's memos and advices have been highly enthusiastic regarding the great strides and technical developments taking place in the Far East and in the Land Down Under. He mentions flash smelting techniques . . . plans for pressure leaching . . . feverish exploration. Likewise Hank reports on new blasting methods from the other side of the world.

We'll have a lot to report when they get back and it won't be because we've gone top-heavy on the international picture. It'll be because we can learn from our friends overseas.

New District Manager

Formerly associate editor of MINING WORLD and WORLD MINING, Stanley H. Dayton has recently been appointed Eastern District manager of the two publications. Mr. Dayton will make his new headquarters in New York City, where he will be in charge of advertising sales and service. He will also be called upon for occasional important editorial assignments and research projects.

Mr. Dayton is a graduate engineer, holding Bachelor of Science degrees in Mining Engineering and Metallurgical Engineering from Washington State University. Following his graduation in 1950, Mr. Dayton worked in various engineering capacities at several mines in the Northwest. He joined the staff of MINING WORLD-WORLD MINING in 1954 and has been continuously associated with the magazines ever since in an editorial capacity.

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Through precise laboratory controls of the elements in steel making — from spectrographic analysis through final heat treating — Naco Grinding Balls possess the correct structure and hardness for maximum impact absorption and wearing qualities. Structurally, Naco Grinding Balls have a grain akin to tool steel — tough, hard and rugged. Laboratory tests show remarkable uniformity in solidity and controlled hardness holding to desired depth. Every day more mill operators are tumbling to the cost-saving advantages of Naco Grinding Balls.

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GOVERNMENT ACTION AND REACTION AFFECTING MINING

Allott Mineral Policy Bill To Give Secretary of Interior Top Control . . .

The hearings on the Allott Mineral Policy bill (S. 1537) remind us that during World War II Senator Murray of Montana introduced a bill which would have set up a Minerals Coordinator whose function would have been to tie together the policies of all the (then) temporary and permanent agencies dealing with mineral matters. The Allott bill could be construed to give the Secretary of the Interior top policy control over mineral functions now in OCDM, OME, OMM, State Department, Commerce Department, and some which lie in the Pentagon. The Secretary of the Interior appears to relish the idea, but the other agencies want out. This bill passed the Senate last year, but it appeared that it would be side-tracked by the passage of the Aspinall mineral policy joint resolution, which, however, did not have the force of law. Repeated attempts by House Interior Chairman Aspinall to get reports on his resolution having failed, the Allott bill has been revived. If passed and signed by the President it would be binding on the agencies and not merely a suggestion on request. ■

Favorable Report Given Beryl-Chromite Bill . . .

Once in a while the Department of the Interior and the Budget Bureau give the mining industry a real surprise. S. 1245, which would make incentive payments to producers of beryl, chromite and columbium-tantalum, has been given the green light. The Interior Department recommended that the chrome payment be reduced from the proposed $46 per long dry ton to $35 per long dry ton and the individual producer's limitation hiked to 10,000 tons annually. Domestic producers have claimed they cannot operate at $35. The beryl program has not yet run out. In its report to the committee, the Interior Department stated:

"It is prudent for the government to encourage exploration for these commodities by direct assistance to private industry in the form of production bonuses. The program provided for in S. 1245 is not a support program, but rather a program undertaken as an adjunct to the progress of research in the government and a stimulant to exploration for beryl, chromite columbium-tantalum." ■

National Energy and Minerals Survival Plan Issued . . .

The Office of Civil and Defense Mobilization has just issued "Annex 33," a "National Energy and Minerals Plan" to be followed after an attack on the United States.

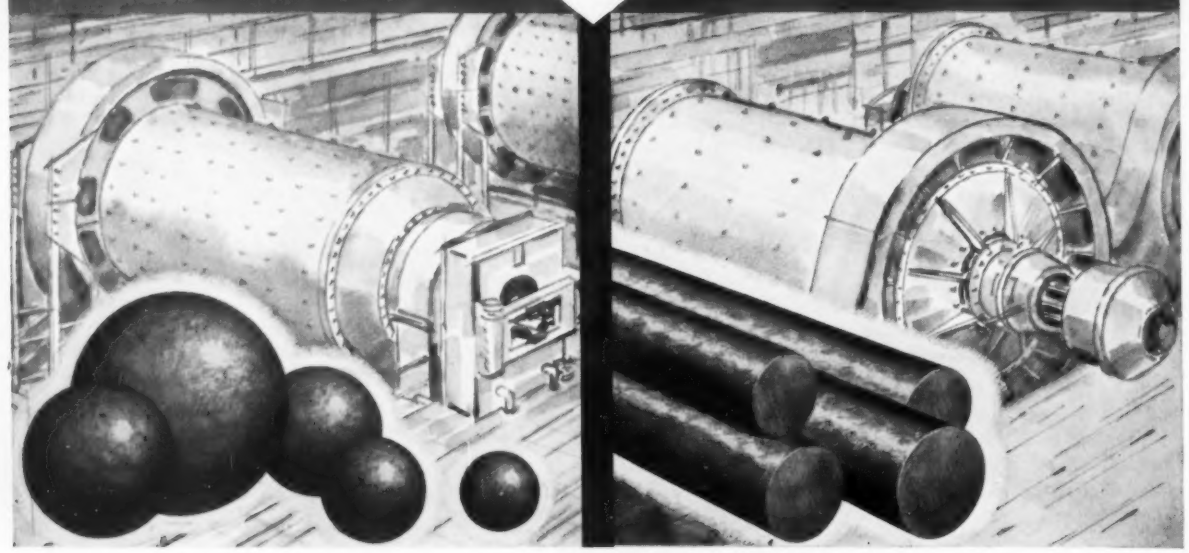
The plan covers the handling of problems dealing with electric power, petroleum and gas, solid fuels and minerals. Nearly all of the authority and planning in these matters appears to be delegated to the Department of the Interior, with some delegations to other agencies and, in certain circumstances, to the states. Among other things the plan for minerals assumes that, "Because of the existence of large stocks of minerals, any loss in mineral production or processing capacity would not be an immediate limiting factor in production of essential survival items." And, "Since minerals, excepting the few used directly in construction and repair (sand, gravel, and stone), would not be required for survival activities during the immediate postattack period, the responsibilities assigned to state and local governments with respect to mineral supply pertain only to those minerals used directly in construction and repair. "Annex 33" also states, "It is customary for mineral-processing and consuming plants to maintain relatively large working stocks of mineral raw materials. For this reason, most of these could continue to operate without immediate replenishment of such stocks. In addition to these normal stocks, there are very substantial quantities of strategic and critical materials in federal stockpiles which have been accumulated for, and be released in, an emergency."

The plans outlined are very interesting and we can only hope that in case of attack there will be a few people left around for a few hours to try and carry them out. ■

"Crazy-Quilt" Legislation In Field of Mining Condemned . . .

Undersecretary of the Interior Elmer Bennett commented recently that it is time to stop "crazy-quilt" legislation in the field of mining. "The ability of the industry to compete with foreign production may often depend in the future on the discovery of low-cost, subsurface deposits of needed minerals. Industry will have to have the incentive of adequate protection for its investments, or these deposits will not be found," Bennett remarked. However, no one has seen the Interior Department rushing to endorse the Murray Geophysical Mining Claims Act, or offer a substitute measure. ■

Total grinding costs are lower with CF&I grinding balls and rods



Grinding Balls and Rods have a direct bearing on major grinding costs — mill throughput and power consumption. The use of CF&I Grinding Balls and Rods will actually increase your mill throughput, lowering power consumption per ton of material ground. This is a result of the microstructure of the high quality steel made and used by CF&I.

CF&I Grinding Balls have the balance of hardness and toughness that provides proper wear and impact resistance. In addition, their excellent abrasion resistance permits them to wear evenly and retain their original shape.

CF&I Grinding Rods — through controlled mill chemistry techniques — have excellent wearing properties, resisting bending and premature breakage.

All these factors contribute to more efficient grinding, higher throughput... lower grinding costs. For the complete story on the advantages of CF&I Grinding Balls and Rods, contact your local CF&I sales office.

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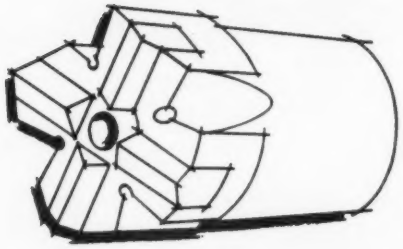
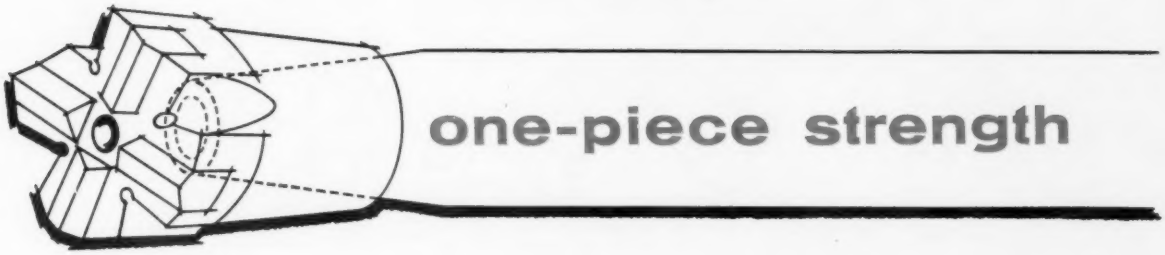


This removable bit gives



one-piece strength

---cuts air-leg drilling costs

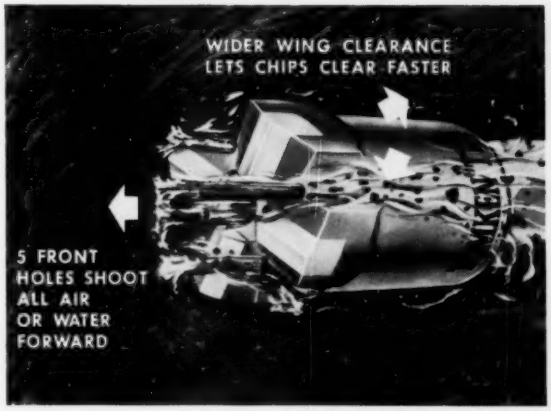
ONE big reason Timken® tapered socket bits save you money is—you don't have to throw away good drill steels after the carbides wear out as you do with intra-sets. Timken bits are removable—yet have one-piece strength. You can keep on using good steels.

And those Timken bits save you even more because only a pocketful are needed for a day's work. Compare that to lugging an armful of intra-sets to the mine face.

Still another reason: with Timken bits you can change bit gauge sizes fast on the same steel. No changing the whole steel.

What's more, *only* the bit itself need go in for resharpening. You don't have to haul the whole steel. And Timken bits give longer gauge wear because there are four cutting edges. Most intra-sets have only two.

Add them all up and see why you'll cut your drilling costs with the TTC—air-leg bit that's tapered for one-piece strength—made of tough, Timken fine alloy steel for longer life. The bit that clears chips faster as the diagram at right shows. Send for free brochure, "Timken Removable Rock Bits". The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO". Makers of Tapered Roller Bearings, Fine Alloy Steel and Removable Rock Bits.



FASTER CHIP CLEARANCE because five front holes shoot air or water directly against the rock face. And deeper, wider wing clearance lets chips wash back faster.

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12
P&H

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12

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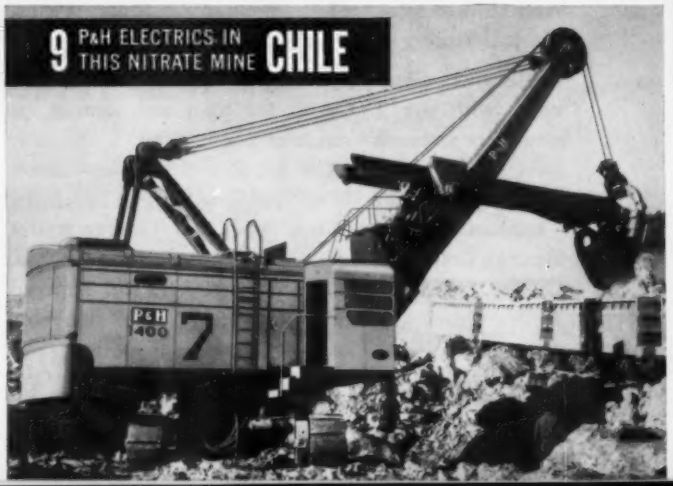
1400
47


9 P&H ELECTRICS IN THIS NITRATE MINE CHILE
P&H
1400
7

...Throughout the Americas...

More mines are STANDARDIZING on P&H ELECTRIC SHOVELS

...more evidence that one P&H always sells another

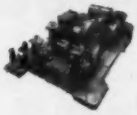
Look at the evidence: Count the P&H Electric Shovels now in use in each of the mines shown here. It's the same story you'll find in mine after mine: once a P&H electric shovel is on the job, performance records show production increases and lower unit costs that simply make it good business to standardize on P&H. Because more mines are following this trend, Harnischfeger now is the world's largest builder of full electric and diesel-electric shovels.

P&H Electric Shovels incorporate many dramatic new design fundamentals which make them different from all others.

Foremost is MAGNETORQUE® drive—the exclusive *patented* hoist drive that puts more material into the dipper, faster—with every pass! It is the most productive digging motion drive known for electric shovels, producing higher bail pull, greater dipper fill factor and automatic impact protection for the hoist machinery.

FIVE EXCLUSIVE P&H FEATURES

MAGNETORQUE DRIVE
Electro-magnetically transmits full digging power of A.C. motor direct to dipper—without motor generator set conversion to D.C. current.



FULL WELDED STEEL CONSTRUCTION
Unit-welded rolled steel design pays dividends in exceptionally long shovel life in hard digging.

ENCLOSED HOIST MACHINERY
No open gearing—all power trains for hoist, swing and propel drives are enclosed in oil-tight gear cases.

INDEPENDENT CRAWLER PROPEL MOTION
P&H gives you independent motors for each function—the basic principle of electric shovel design and purpose.

HIGH STRENGTH T-1 STEEL
Only Harnischfeger uses it as *standard* in fabricating a boom and dipper handle with highest impact absorption ability.

Another major reason why "One P&H Always Sells Another" is single-source responsibility for service. Harnischfeger is the only shovel manufacturer which makes its own electrical as well as mechanical components—all designed and matched by a single manufacturer *specifically for balanced electric shovel production cycles*. For more information write Harnischfeger Corporation, Milwaukee 46, Wisconsin.

HARNISCHFEGER
Milwaukee 46, Wisconsin

P&H
CONSTRUCTION & MINING DIVISION

Gardner-Denver FL58 Air Feed Leg Drill

A one-man jumbo—
Gardner-Denver Air Feed Leg Drill

Gardner-Denver Air Feed Leg drills hit hard . . . keep hole production up and costs down. Two drill bore sizes to choose from: 2½″ and 2⅝″. Feed travel from 24″ to 60″. Ask your Gardner-Denver mining specialist for details.

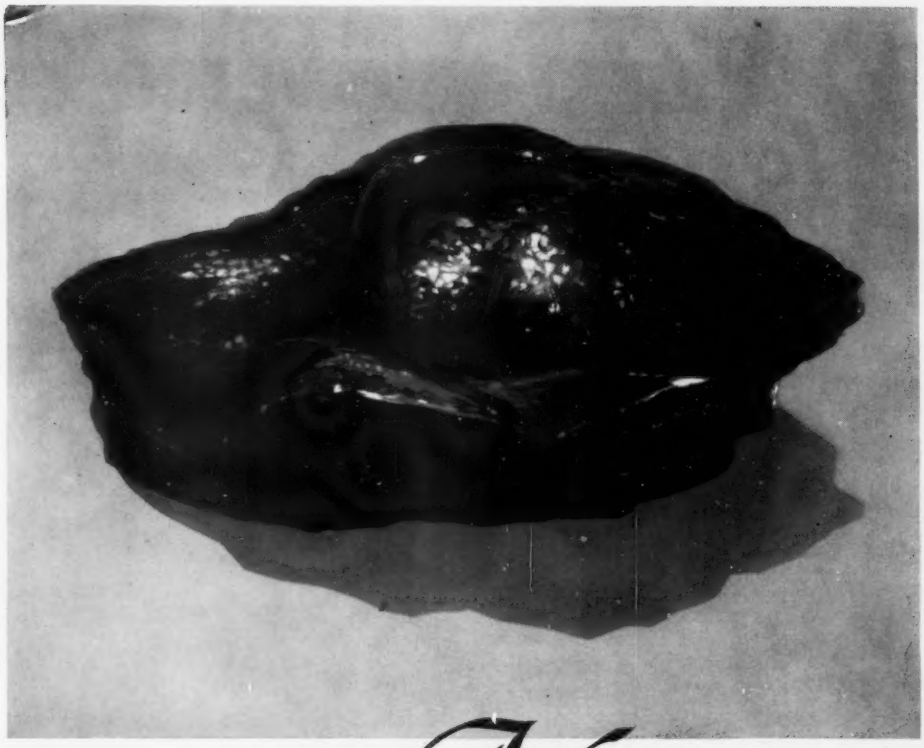
Write for bulletin.

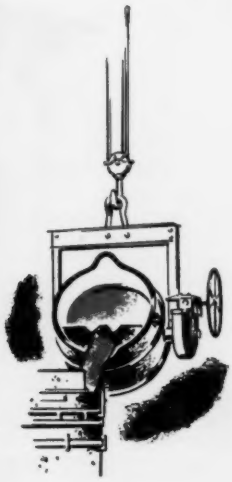
- **Easy to use**—controls all grouped on back head. Single air line supplies both drill and leg.
- **Push-button bleed**—air release in feed leg backs drill off fast after drilling out.
- **Exclusive water gland**—water automatically goes to bit before drilling starts . . . stays on until drilling stops.
- **Versatile**—can be fitted with a variety of legs, including telescopic models. Drill easily removed for use as sinker.

EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER - DENVER

Gardner-Denver Company, Quincy, Illinois
International Division, 233 Broadway, New York 7, New York
In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario





Hematite

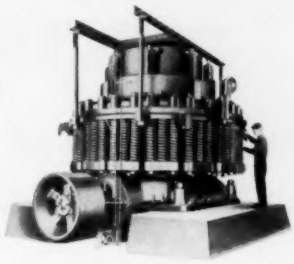
Fe_2O_3

...life blood of Industry

Derived from the Greek word meaning blood, or blood-like, Hematite was so named because of the reddish hue found in most of its varieties. This important mineral has indeed provided "life blood" for the iron and steel sinews of industry. For many decades, Hematite—the basic ingredient which feeds the blast furnaces of the world—has been one of the most important minerals of civilization.

Symons Cone Crushers, with their great capacity for finely crushed material at low cost, have been an important factor in the efficient reduction of the Hematite, as well as the Magnetite and Taconite iron ores throughout the world, and have established outstanding production records in keeping pace with industry's insatiable demands.

NORDBERG MFG. CO., Milwaukee 1, Wisconsin



SYMONS CONE CRUSHERS

. . . The machines that revolutionized crushing practice . . . **are built in a wide range of sizes, for capacities to over 900 tons per hour. Write for descriptive literature.**

©1959, N. M. CO. C459

NORDBERG

SYMONS . . . a registered Nordberg trademark known throughout the world.

ATLANTA • CLEVELAND • DALLAS • DULUTH • HOUSTON • KANSAS CITY • MINNEAPOLIS • NEW ORLEANS • NEW YORK • ST. LOUIS
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"Planet-powered '25"

"Our International TD-25's turbocharged engine doesn't seem to lug down under load," states Charles Skelton, superintendent for Mulzer Brothers, Tell City, Indiana. "This power, combined with planetary steering and Hi-Lo power shifting gets full loads fast and speeds-up load delivery stripping overburden."

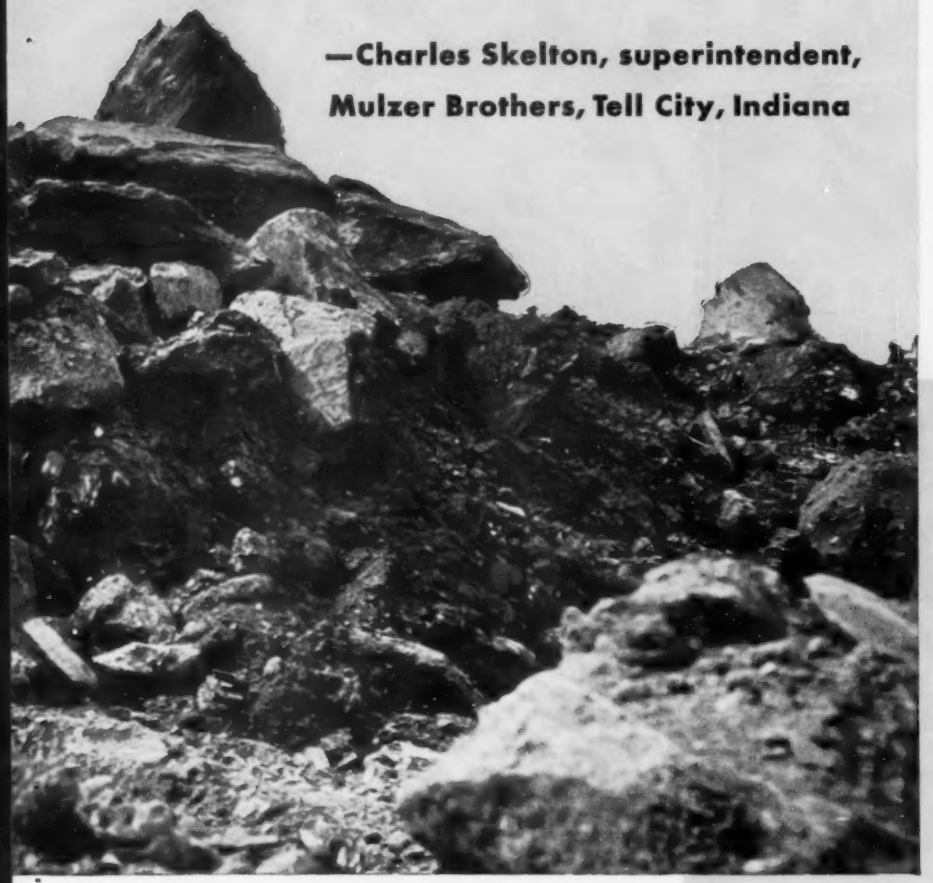
That's another way of saying that the "25," working three shifts daily on this coal-stripping operation, gives operating efficiency a big boost! They're stripping 30-foot overburden to get at a 42-inch coal seam: one-third earth; two-thirds shale, slate, and rock. The "25" takes off the top third—pushing full blade loads an average of 100 feet. A 6-yd. dragline removes the rest.

How a "25" outblades other rigs up to 50%—You 'doze straight ahead with heavy offset loads—you make full-load, full-power turns—where giant clutch-steered rigs slip, slue, and spill the load. Exclusive TD-25 "live track" Planet Power-steering eliminates load-limiting "dead-track drag."

With exclusive Hi-Lo, on-the-go power-shifting, the "25" gives you instant, all-the-way matching of power to condition. You roll up big loads in a hurry—and

gets full loads fast . speeds up delivery, stripping overburden"

—Charles Skelton, superintendent, Mulzer Brothers, Tell City, Indiana



Stripping overburden three shifts daily, Mulzer Brothers' TD-25 blades full loads, an average of 100 ft. Planet Power-steering and Hi-Lo power-shifting keep full loads on the move full time. On benching or highwalling, simply operate the bank-side track in high speed range, while keeping the outside track in low range—for full-bite, full-blade performance.

Here's your 76-page cost and production estimating book— newest, most authentic and complete guide for estimating material-moving costs—and for selecting equipment combinations for top profits, anywhere! See your International Construction Equipment Distributor!

keep 'em rolling fast. And with exclusive International DT-817 Diesel engine wallop, the "25" bulls along, 230 turbocharged hp strong—without "slow-motion" lug-downs, even at high altitudes!

Press the direct-start button—power-shift and power-steer the planet-powered TD-25 with full-king-size loads—around curves, upgrade, anywhere. Prove what it means to command full-time, full-load ability to outwork and outearn king-sized clutch-steered crawlers—up to 50%! See your International Construction Equipment Distributor for a demonstration!

International® Construction Equipment

International Harvester Co.,
180 North Michigan Ave., Chicago 1, Ill.
A COMPLETE POWER PACKAGE

with CYANAMID EXPLOSIVES!

The less it costs to blast and load a ton of ore . . . the more money you make. It's that simple . . . and that difficult.

Cyanamid helps you reduce your cost per ton of ore mined, with a complete line of high quality explosives, exclusively designed to give economical breakage.

Whether your ore is pure or disseminated, in thick deposits or thin veins, whatever the pitch of your vein or the nature of your ore body, there's a Cyanamid explosive that will break ore loose in a form convenient for handling.

When you call on Cyanamid, you also profit from the valuable technical assistance of our experienced explosives engineers. Prompt delivery from a nation-wide network of plants and magazines keeps production moving.

For information on Cyanamid's complete line of explosives and blasting accessories, phone or write our nearest office.

CYANAMID

AMERICAN CYANAMID COMPANY
EXPLOSIVES AND MINING CHEMICALS DEPARTMENT
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PLANTS: Latrobe, Pennsylvania • New Castle, Pennsylvania • Springville, Utah
PRODUCTS: High Explosives • Permissibles • Seismograph Explosives • Blasting Agents • Blasting Caps • Electric Blasting Caps • Blasting Accessories

RG-2JS
For extremely hard abrasive rock
(Taconite, quartzite)

W7R
For hard rock
(Siliceous limestone, dolomite, sandstone, granite)

OW
For medium rock
(Limestone, sandstone, sandy shales)

OSC-1G
For soft formations
(Calcite, shale, clay)

HUGHES ROCK BIT RESEARCH HELPS YOU GET BLAST HOLES DOWN FASTER

In furthering the development of "Rota-Blast" rock bits for mining, all new bit designs are thoroughly tested in the Hughes drilling laboratory before they are released to the field. A rotary drill, capable of simulating actual field conditions, is used for tests in which thousands of blocks of rock, such as the 5-ton block of quartzite, pictured here, have been drilled. These blocks represent the types of formations in which the bits being tested are to be used.

Performance of bits is observed under various weights, rotational speeds, air pressures and air velocities. Distinctive patterns, cut by each type of bit on bottom, are studied to help in the evaluation and improvement of rock bit design and performance.

Through Hughes' research in the laboratory and in the field, advances are constantly being made in the design and manufacture of every size and type in Hughes complete line of "Rota-Blast" rock bits. This continuing research program — largest in the industry — was started more than fifty years ago.

Your Hughes representative will recommend the "Rota-Blast" bit designed to keep your drilling costs down. He is also qualified to offer you assistance in your blast-hole drilling program. His help is available for the asking.

HUGHES
industrial products
HUGHES TOOL COMPANY • HOUSTON, TEXAS

More proof that...

AMSCO HELPS YOU MOVE MORE TONS PER DOLLAR

How a large contractor and a crusher manufacturer have cut downtime and increased service life with AMSCO equipment

AT MT. VERNON CONTRACTING CORP.

DAILY "TOOTH REPAIR" ELIMINATED BY SWITCHING TO AMSCO 2-PART TEETH

Mount Vernon Contracting Corp. is a large general contractor doing work throughout the middle Atlantic states. Its present contract is for road construction on the Cross Westchester Expressway, linking the New York State and New England Thruways.

The firm's four power shovels and two backhoes on this job are equipped with Amsco dippers or dipper parts and Amsco Simplex* 2-Part Teeth. Reason: competitive teeth previously used required daily welding build-up to maintain their points. Now, since switching to the Amsco Simplex, teeth are changed only about once a week. And change-over is *only a 5-minute job!*

With shovels operating 8 hours a day, 5 days a week, this is a mighty important advantage for Mt. Vernon. No wonder they say—"These Simplex teeth really stand up in service, especially in rock, and save us a lot of downtime."

*Patent No. 2,904,908

AT HIGHWAY MACHINERY COMPANY

AMSCO CRUSHER ROLLS HANDLE 50,000 YDS. BETWEEN BUILD-UPS

Carroll Hicken (left) owner of Highway Machinery Company, Waukesha, Wisconsin, is a long-time user of Amsco equipment. His firm designs and manufactures self-propelled machines for crushing road material, both gravel and stone. All of their machines are rented out or sold to contractors, with maintenance and service handled by Highway Machinery.

For years, the company has used Amsco Manganese Steel Crusher Rolls exclusively. Amsco Manganese welding rods and bars are also used for build-up. On a typical rental machine, pictured at right, the Amsco rolls had *crushed over 50,000 yds. since their last build-up* six months before.

Mr. Hicken says that with Amsco Manganese rods he can multiply the life of a roll by 5 to 10 times. He adds—"They have proven very fine, and we're getting more yardage than with any rods we formerly used."

AMSCO

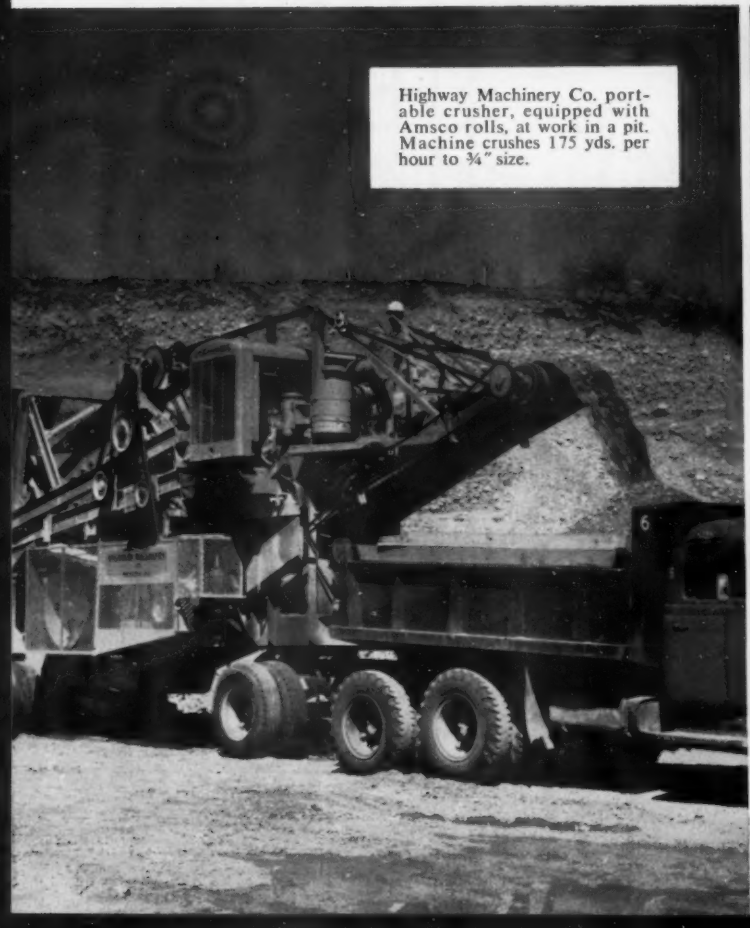
AMERICAN Brake Shoe COMPANY

American Manganese Steel Division • Chicago Heights, Ill.

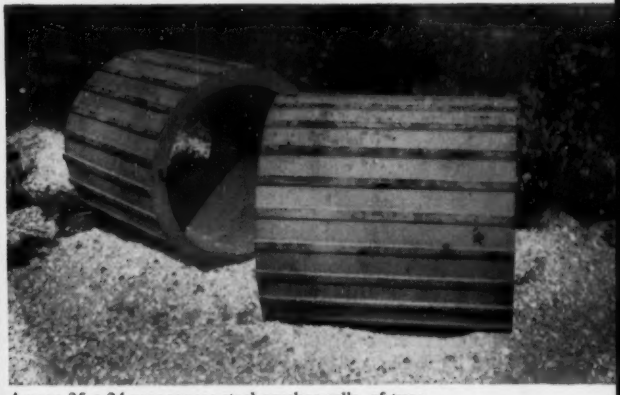
Other plants in: Denver • Los Angeles • New Castle, Dela. • Oakland, California • St. Louis
In Canada: Joliette Steel and Manitoba Steel Foundry Divisions
Welding products distributed by Canadian Liquid Air Co., Ltd.

Northwest shovel, equipped with Amsco Dipper and Simplex 2-Part Teeth, at work on Cross Westchester Expressway project.

Shovel operator, Walter Reich, inspecting Amsco Simplex 2-Part Teeth used on Mt. Vernon Contracting Corp. shovel.



Highway Machinery Co. portable crusher, equipped with Amsco rolls, at work in a pit. Machine crushes 175 yds. per hour to ¾" size.

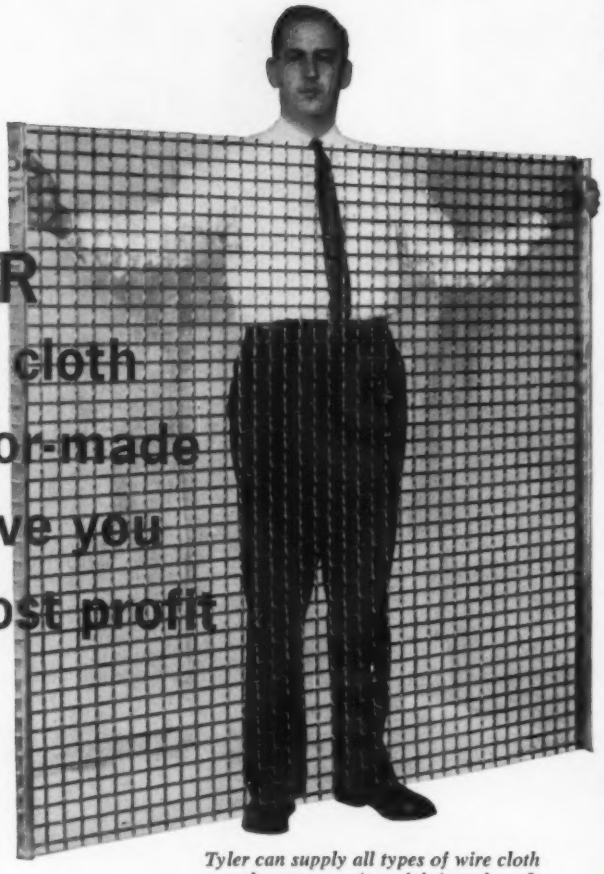


Amsco 25 x 24 manganese steel crusher rolls, of type used in portable crusher at left.

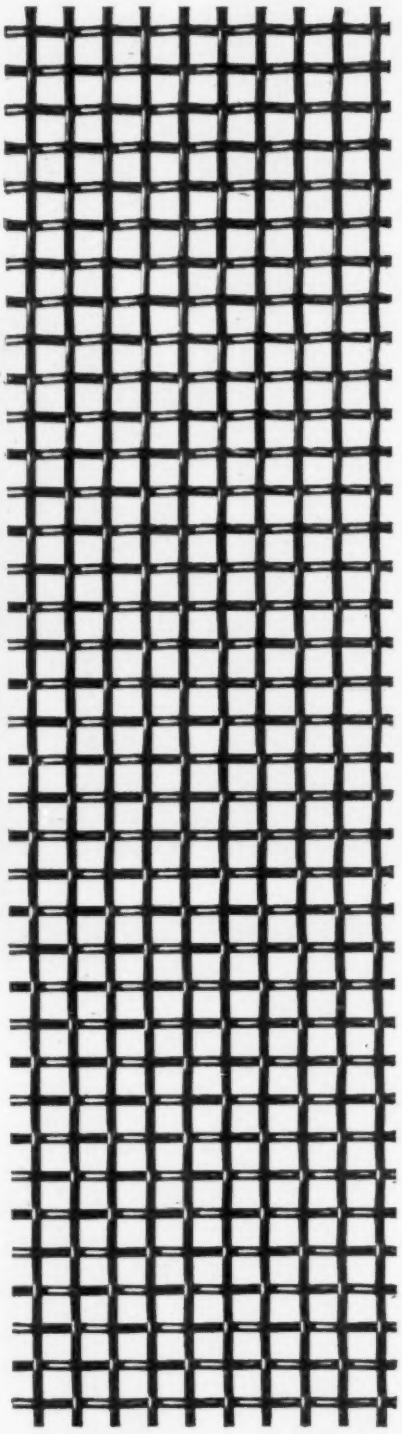
Welder demonstrating how Amsco Manganese rods are used for build-up on rolls.

TYLER

wire cloth is tailor-made to give you the most profit



Tyler can supply all types of wire cloth — and screen sections fabricated to fit every existing type of vibrating screen.



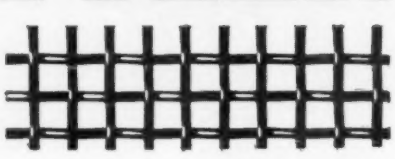
Tyler does more than manufacture 53,000 different specifications of wire cloth. It starts by designing the specifications to solve each problem to your greatest profit.

Selection and control of the metal is important—especially where corrosion, abrasion, or contamination are factors. Tyler controls the design of all metals and alloys used in weaving, and in addition operates its own wire mill for processing all its non-ferrous and many of its stainless steel wires. Tyler Screens are literally tailor-made for maximum profit to the user.

Ask your Tyler representative for full information—through him you'll get *Tyler Screening Service.*

WOVEN WIRE SCREENS • SCREENING MACHINERY • TESTING SIEVE EQUIPMENT

TYLER



The W. S. TYLER Company • *Cleveland 14, Ohio*

OFFICES: New York • Chicago • Boston • Philadelphia • Atlanta
Dallas • Los Angeles • San Francisco • Baltimore • Birmingham • Houston • Minneapolis
Pittsburgh • Salt Lake City • The W. S. Tyler Company of Canada, Limited,
St. Catharines, Ontario • OFFICE: Montreal

This Lima Type 1250 equals output of more expensive competitive shovel at W. Va. mine site.

Lima outperforms

says Paul Carapellotti, Mgr.
Huberta Coal Co., Steubenville, Ohio

"We tested our first Lima by working it next to a competitive machine. The Lima proved superior. It did more work with less maintenance. We now own five Limas—a 1201, two 2400's, a 1250 and a recently purchased 802 Lima Coal Loader with 3-yd. dipper.

"The 1250 is small enough to be very mobile; big enough to handle its own stripping and loading as dragline or shovel. It does as much work as a heavier rated competitive rig costing considerably more."—*Paul Carapellotti, Mgr., Huberta Coal Co., Steubenville, Ohio.*

Lima's are better built and better engineered for dependable high production, trouble-free operation. They are favored by mine operators because they outdig, outstrip and outlast other makes.

There's a Lima type and size for every mining job. Shovels to 8 yd., draglines variable; choice of gasoline, Diesel or electric power; crawler, truck or wagon mounting. Ask for facts. See your nearby Lima distributor. Or write Construction Equipment Division, Baldwin-Lima-Hamilton Corporation, Lima, Ohio.

DISTRIBUTORS IN PRINCIPAL CITIES OF THE WORLD

Cable Address LIMASHOVEL, Lima, Ohio, U.S.A.

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Shovels • Cranes • Draglines • Pullshovels • Roadpackers • Crushing, Screening and Washing Equipment

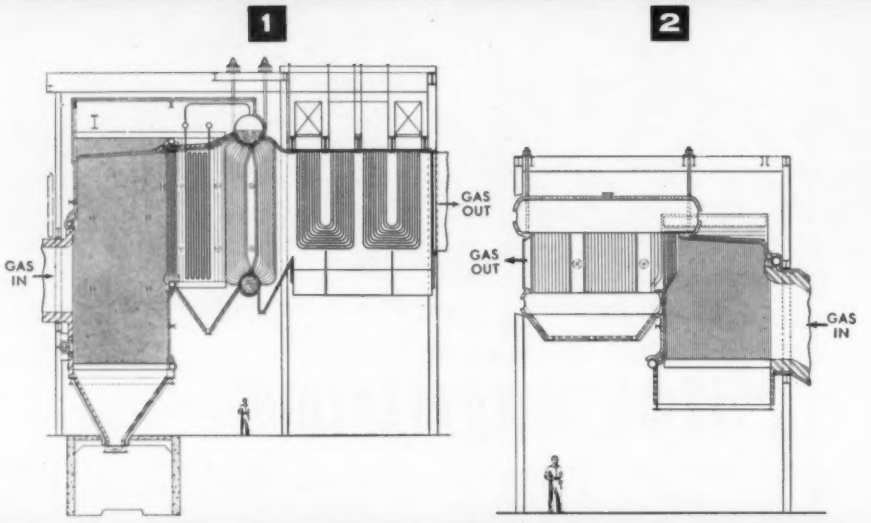
Effective Utilization of Waste Heat in Metallurgical Processing

CUSTOM-ENGINEERED B&W UNITS

Illustrated are 5 B&W Heat-Recovery Units, typical of many currently serving the metallurgical process industries. Complete data on application and modification of these and other units will be found in B&W Bulletin G-88, previously mentioned. Please write for your copy today. Address: The Babcock & Wilcox Company, Boiler Division, Barberton, Ohio.

B&W WASTE HEAT RECOVERY UNITS FOR

1. Copper Reverberatory Furnaces
2. Refining Furnaces for Copper and other metals
3. Ore Roaster, Acid Plant or Kiln
4. Zinc Fuming Furnaces
5. Heat Recovery with high temperature air heating and corrosion section



CONSIDERATIONS

The economic success of many metallurgical processes requires recovery of valuable heat and entrained product particles in waste gases.

In selecting or designing the best boiler for this important task, the following factors must be considered:

- **Quantity of waste gas**
- **Gas temperature**
- **Gas pressure**
- **Chemical constituents of waste gas**
- **Concentration of metallics and ash in waste gas**
- **Size and abrasive characteristics of entrained material**
- **Fusion temperature of material carried in waste gas**

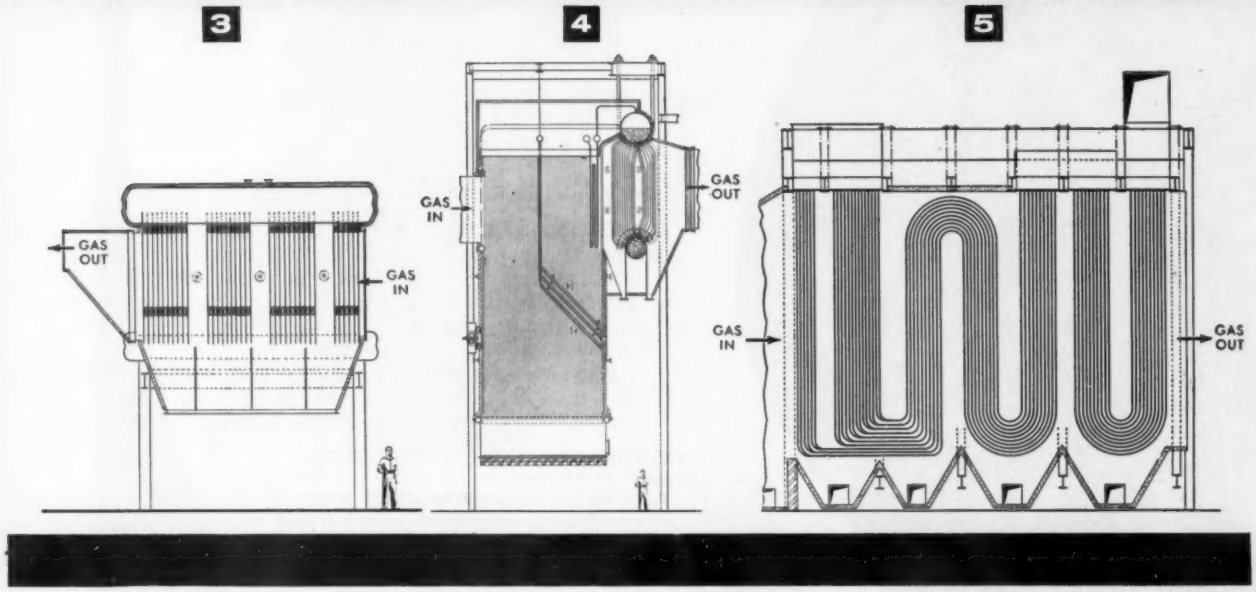
Specific operating requirements further complicate the problem of heat and product-particle recovery. For a complete discussion of Waste-Heat Boilers and their application, write for B&W Bulletin G-88.

B&W DESIGN FEATURES

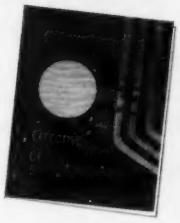
B&W heat-recovery and boiler-design specialists have years of practical experience in designing units for a wide variety of applications. Custom-engineered to meet specific process requirements, B&W Waste-Heat Boilers incorporate the following outstanding design features:

- Slagging problems are eliminated by cooling waste gases below the ash fusion temperature in water-cooled furnaces.
- Waste gas leakage and acid corrosion are eliminated by providing pressure casing. The casing temperature is maintained above the dew point of corrosive constituents in the gases. This inner casing permits operating up to seven inches w.g. gas pressure.
- Tube erosion by gas-borne material is eliminated and low-draft losses are obtained by designing for low-gas velocities, with no gas baffles in the tube bank.
- In-line tube arrangements used throughout permit efficient tube bank cleaning by soot blowers, or hand lancing when appropriate.
- High-efficiency B&W Cyclone Steam Separators prevent solids carry-over in the steam, thus protect against superheater and turbine fouling difficulties.
- Complete visual observation of all heating surfaces is provided with ample, properly located doors and lance ports.
- Hoppers wth steep sloping sides and large outlet connections prevent material "hang-up."

These built-in features assure continuous, trouble-free operation with low maintenance and high efficiency from every B&W Waste-Heat Boiler.



B&W Bulletin G-88
— "Effective Utilization of Waste Heat"
— on request.



ME-101

B&W

THE BABCOCK & WILCOX COMPANY

BOILER DIVISION

Photos slightly reduced

NI-HARD mill liners

...good to the last ¼"

Original liner 3¼" minimum thickness. Worn to ¼" before replacement. No breaking. No cracking. Outlasted unalloyed white iron 2.15 to 1 and manganese steel 1.46 to 1

MILL LINER MINIMUM THICKNESSES

If you are unacquainted with Ni-Hard* mill liner segments, the table below will give you a rough guide to the minimum thicknesses for an initial installation. Thinner liners than these can and are being used based on individual experience, but the thicknesses contained in the chart are suggested as a starting point for the mill man who is thinking about using Ni-Hard liners for the first time.

MINIMUM MILL LINER THICKNESS

MILL DIAMETER	SIZE OF GRINDING BALLS OR RODS			
	1"	2"	3"	4"
6	1.5"	2.0"	2.5"	3.0"
8	1.75	2.25	2.75	3.25
10	2.0	2.5	3.0	3.5

"Ni-Hard mill liner segments are available from authorized producers throughout the country. For the address of the one nearest you, write to Inco."

*Registered trademark

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street — New York 5, N. Y.

NI-HARD

NICKEL MAKES CASTINGS PERFORM BETTER LONGER

HEAVIER OUTSIDE WIRES mean great resistance to abrasion. FINER INSIDE WIRES mean excellent drum winding characteristics.

In REGULAR LAY ropes the wires are laid in a direction opposite to the lay of the strands. This provides stability even under severe operating conditions.

In LANG LAY ropes the wires and strands are laid in the same direction, providing exceptional flexibility and abrasion resistance.

Two ropes in one! Roebling Herringbone® Wire Rope is designed and made to wear better, work better, last longer than you can possibly imagine . . . unless you've tried it yourself!

Herringbone combines two pairs of Lang Lay strands with one pair of regular lay strands to give you maximum flexibility, good stability, mighty strength. Call your Roebling Distributor — or write for details to Roebling's Wire Rope Division, Trenton 2, N. J.

HERRINGBONE WIRE ROPE

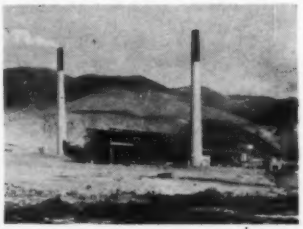
ROEBLING

Branch Offices in Principal Cities
John A. Roebling's Sons Division
The Colorado Fuel and Iron Corporation

PROJECT— COPPER

Another Complete Mill-to-Smelter Plant ENGINEERED by STEARNS-ROGER

This smoothly operating project including copper mill, smelter and power plant was designed to process 30,000 tons per day. The engineering performed by Stearns-Roger included designs for concentrator, smelter, heavy density plant, power plant, crushing plant, and specifications for thousands of items of mill and smelter equipment. Engineering of supporting facilities also furnished includes two complete townsites, public buildings, machine and maintenance shops at mine, mill and smelter, transmission lines and lime plant. Stearns-Roger offers reliability in design, engineering, fabrication, field erection and start-up. One-contract engineering services for your chemical or metallurgical plant project are our specialty.



Stearns-Roger

THE STEARNS ROGER MFG. CO. • DENVER, COLORADO

P. O. BOX 5888 • DENVER 17, COLORADO

DENVER • HOUSTON • SALT LAKE CITY

Stearns-Roger Engineering Co., Ltd., Calgary, Alberta

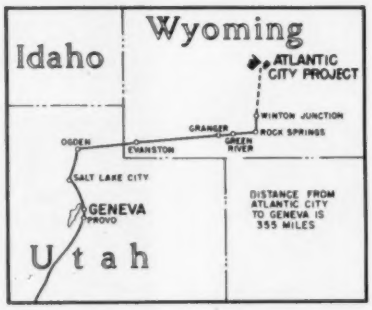
Wyoming Taconite Project To Get Underway

The Columbia-Geneva Steel Division of United States Steel Corporation has announced that work will begin immediately on construction of an iron ore mining and beneficiation facility in Fremont County, Wyoming, some 26 miles south of Lander.

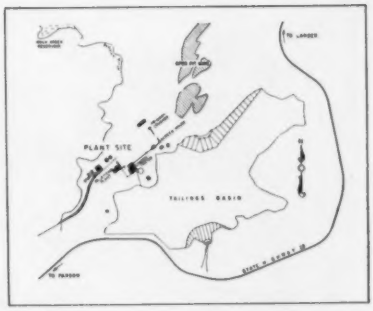
After completion late in 1962, the extensive ore mining, concentrating and pelletizing operations will supply pelletized iron ore to Columbia-Geneva Steel's integrated steel plant at Geneva Works, near Provo, Utah. The ore will supplement Geneva's present source of iron ore from mines near Cedar City, Utah, which will continue in operation.

Known as the "Atlantic City Project," the location is 8,300 feet above sea level in Wyoming's rugged Wind River Mountains. It is destined to become the highest, large-scale open pit iron mining operation in the United States. The ore body itself lies near the Continental Divide crossing of the old Oregon Trail—not far from Atlantic City and South Pass City, now typical Rocky Mountain ghost towns.

Exploration to date has indicated 300,000,000 tons of taconite assaying from 21.8 to 35.2 percent Fe. Proven reserves are estimated at 121,200,000 tons assaying between 28 and 32 percent Fe. Conventional open pit methods will be used to mine the ore, which will go through a three-stage crushing and screening facility, then be conveyed to the concentrating plant where it will be magnetically concentrated to more than 60 percent Fe.



Ore concentrate will finally move to the pelletizing plant for forming—under intense heat—into marble sized balls, or pellets, ready for Geneva's blast furnaces. The pelletized ore will be shipped from Atlantic City via a new 76-mile railroad spur to the Union Pacific line at Winton Junction and then 355 miles to the Geneva Works near Provo, Utah.



Besides the concentrating and pelletizing plant, other surface facilities will consist of an extensive water storage and handling system, loading and shipping facilities, general and mine offices, maintenance shops, warehouse, and a testing laboratory, as well as a dispensary, fire and ambulance stations.

It will cost an estimated $60,000,000 to develop the open pit mine, build the mill, and the 76-mile standard gauge railroad to Winton.

The Bechtel Corporation of San Francisco has designed the mill and Mr. Stanley H. Cohlmeyer will direct the construction activity for United States Steel.

Early Development of Brazilian Nickel Deposits Seen

Recent availability of hydroelectric power near a known source of nickel in Brazil, has sparked plans for an integrated mine and plant capable of producing 1,000 tons per mouth of nickel contained in a ferronickel electric furnace product.

Brasimet, a Brazilian company belonging to the Hoschild group, has done some preliminary surveying on a nickel deposit located in the State of Minas Gerais in Brazil. To develop the industry, it has turned to several associates, among which are companies affiliated with the Bank of Indochina and Societe Anonyme Le Nickel of France. Le Nickel operates the nickel-producing mines and plants on New Caledonia and can furnish the technical direction for the proposed Brazilian project.

The above organizations have formed Societe Morro do Niquel, have also obtained control of promising nickel deposits near the towns of Passos and Pratapolis in Minas Gerais.

Nickel deposits have been known in the above area for some time. The deposits were accessible, but never developed because of the lack of cheap power. With the erection of important hydro-electrical facilities on the Rio Grande River at Peixeto and Furnas, development of a nickel producing operation appears more attractive.

The Precambrian areas of Minas Gerais consist principally of a very crystalline series of gneissic rock near the base, and a series called de Minas near the top. There are many intrusions of basic peridotites. Most of the peridotites contain some nickel and the process of weathering and erosion have combined to decompose some of the outcrops with a resulting concentration of nickel.

The Morro Do Miquel deposit is a round dome corresponding to one of the above mentioned peridotite outcrops. It stands 100 to 200 meters above the surrounding ground and has an eliptical base with a long axis measuring 1,000 meters. The short axis is about 500 meters in length. The top of the dome is covered with ferruginous laterite and washed quartz shots that hide a discontinuous nickeliferous mineralized zone. Mineralized serpentines outcrop on the hill side or are barely covered by a strata of laterite about 50 centimeters thick.

Brazilian interests state that mining will not represent a problem. The ore will be developed in levels with the help of small mechanical equipment.

Christmas Mine Development

by John R. Bogert
Field Editor, Mining World

PLANNED MILL SITE is on slope to right of the McDonald shaft. Design of the 4,000 tpd concentrator is completed and construction is expected to start shortly.

There is a lot of activity these days around the old Christmas mine in southern Arizona. Ever since the Inspiration Consolidated Copper Company took an interest in this copper property in 1954, things have been humming. Today, a gleaming steel headframe overlooks the old camp site, and the noise of bulldozers and construction machinery attest to the fact that the Christmas mine will soon be in production again.

Located in the Banner mining district of Gila County in southern Arizona, the Christmas mine is approximately 10 miles north of Winkelman on State Highway 77. Discovered in the 1880's, the mine passed through the control and ownership of various mining companies. However, due to its isolated location and the fluctuation of metal prices, only intermittent operations were carried on until World War II. According to mine records, though, production through 1954 was 1,554,500 tons for a total of 54,969,573 pounds of copper.

The ore bodies at Christmas have attracted the attention of many mining companies, and several drilling programs were initiated in the past, including work by the U. S. Bureau of Mines and the Geological Survey. However, the intense development program started by Inspiration Consolidated Copper in 1954 marked the beginning of a new life for this famous mine. During 1955, 1956 and 1957, Inspiration deepened the No. 3 shaft from 916 to 1450 feet with stations cut at the 1100, 1300, and 1400 levels; and drove over 16,800 feet of development drifts and raises. This successfully developed ore reserves of 20,061,625 tons of proven and probable ore averaging 1.83 percent copper, with a recoverable copper content of 660,000,000 pounds.

Geologic studies of the mine have shown that the ore bodies are pyro-metasomatic in type, occurring as replacements in metamorphosed Paleozoic limestones. These ore-bearing limestones have been altered, intruded by diabase and diorite, cut by basaltic and andesitic dikes, and covered by andesite flows. In addition, the mineralized

The Inspiration Consolidated

areas have been cut by many complex faults, the most important being the Christmas fault with a total displacement of approximately 1,200 feet. In the ore zones, the principal metallic minerals formed were chalcopyrite, bornite, magnetite, pyrite, sphalerite, and pyrrhotite. Small amounts of galena and specular hematite occur near the outer margins. Molybdenite occurs sparsely while magnetite increases with depth. Above the 300 level of the mine, oxidation is almost complete and extends locally to below the 800 level. Secondary ore minerals of minor importance include chalcocite, native copper, copper oxides, and copper carbonates.

The underground development work and surface drilling during 1955-1957 determined that another shaft was needed to properly mine the new ore horizons. In the past all tonnage came from the No. 3 shaft, which was now totally inadequate for the future anticipated production. The old No. 3 shaft is just above the camp site and old mill, and is on the south side of the principal ore bodies to be exploited in the years to come. A new production shaft was needed to the north, close to the proposed location of the new mill. Thus the McDonald shaft on the crest of the ridge north of the older Christmas operations was proposed.

The McDonald Shaft is named in memory of the late "Alex" McDonald who aided in the early examination and acquisition of the property and in mine development planning.

Sinking of the McDonald shaft started in December 1959 after the erection of the permanent headframe. This steel headframe, of unusual design, is 169 feet high and was built to specifications by the Allison Steel Co. and erected by the Van Dyke and Dail Construction Company

Proceeds at Fast Pace

MINE WAREHOUSE at portal (out of sight to left) of the short supply adit that is the 90-foot level of the McDonald shaft. Concentrator site in background.

HOIST HOUSE foundations being poured to house Nordberg 13-foot diameter double-drum ore hoist and 10-foot double-drum service hoist for cage and counterweight.

Copper Company hopes to have mine in production by late 1961

of Phoenix. It is a split level structure with separate discharge chutes for ore and waste. Two 12-ton bottom dump skips eventually will handle 4,000 tons of ore per day plus quantities of waste.

The McDonald shaft is circular, 18 feet in diameter, containing two 5- by 6-foot compartments for hoisting ore plus one 11- by 6-foot compartment for men and equipment. The planned depth of the shaft is 1780 feet and it will be entirely lined with concrete. As of June 1, the shaft was down to 636 feet of which 626 feet were concreted. Permanent steel shaft sets are closely following the sinking operations. An adit at the 90-foot level handles equipment and supplies. The portal of this short adit is within a few feet of the mine warehouse to the north of the headframe.

A permanent hoist house is now being completed beside the McDonald headframe and will eventualy house a Nordberg 13-foot diameter conventional double drum ore hoist and a Nordberg 10 ft diameter double drum service hoist. An Ingersoll-Rand air compressor delivering 3,000 cubic feet per minute is being used for the shaft sinking, and is housed in a neat building beside the hoist house. This compressor, plus an additional one to be installed, will also be used for mining operations. A modern change house, mine office, and a warehouse complete the present surface installations. Water is stored in a 40,000-gallon storage tank a short distance behind the compressor building. Process water will be stored in a 1,000,000 gallon tank to be constructed in the near future.

Construction on the primary crushing plant, close to the McDonald headframe has begun. Plans for the screening, grinding, ore transfer and storage facilities are complete. The mill location, to the northwest of the McDonald headframe, has been selected and design on the 4,000 ton-per-day concentrator is about completed. Construction is expected to begin shortly.

The recent underground development at the Christmas mine has been extensive. Working from the No. 3 shaft, the 1300 and 1400 levels have been extended, and many development raises driven in preparation for later mining. The No. 3 shaft was deepened further to a depth of 1682 feet. In July, drifting will be started on the 1600 level to eventually connect with the McDonald shaft 5000 feet to the northeast. This 1600 level has been planned as the main haulage level for the new mine, and will be 10 feet 8 inches by 10 feet in size. The drifting work is being done with a Joy jumbo and an Eimco 630 loader. Eventual mining will be open stopes supported by pillars and back fill.

After earlier laboratory work, the old mill at the Christmas property was converted to a pilot mill for testing. Since July 1959, it has operated at a rate of about 80 tons per day on ore produced from development headings.

Barring unforeseen delays, the underground development and surface plant of the Christmas mine should be completed by late Fall of 1961.

Copper concentrates produced from the new mill will be trucked 40 miles to the recently acquired International smelter of the Inspiration Consolidated Copper Company at Miami, Arizona.

Late Fall of 1961 will see operations resumed at one of Arizona's most important underground copper mines. At that time, the Inspiration Consolidated Copper Company, and Mr. Bruce B. Whitney, general superintendent; Mr. Norman Thompson, mine superintendent; Carl Brick, Chief Mine Engineer and Mr. John T. Eastlick, chief geologist; with their staffs will indeed be proud of a good job well done. END

Miners Beat Ambrosia Lake Problems;

by George O. Argall, Jr.

Editor of Mining World

New methods developed for mine drainage

• • **Early Underground Mining Below Water Table** proved most difficult because broken ore and waste mixed with water to form a sloppy mass which presented many material handling problems. This soupy muck was so abrasive that it cut the guts right out of pumps and other mining equipment. Haulage ways were impossible to maintain for off track equipment. Soft bottom, ruts, and pot holes tore up equipment, and created one of the world's worst mining problems.

• • **Progress Was Made On Many Fronts By 1959** as underground development proved that ore blocks could be drained, water could be desanded and deslimed ahead of shaft pumping, and shaft sumps could be cleaned mechanically. The miners learned how to operate mechanical equipment in deep and abrasive mud; the manufacturers were building better machines by taking advantage of experiences resulting from use of earlier models. Most importantly, by this time, it was proven that the ground was largely self supporting. In fact the ore actually hardened as it dried out. However, the ground proved treacherous and tricky, but not heavy. Rockbolting and wire fabric support is widely used in underground headings in this district.

• • **Today Mines Are Reaching Designed Output** as sub level development is speeded to drain ore well ahead of mining. Ground continues to harden as drainage improves in most areas. Sublevel caving and other low cost mass mining methods are producing greater tonnages of ore. Pumping problems have been solved by using special type pumps. There is a great upsurge in long hole underground drilling for drainage and ore delimitation and assaying. Rock bolting proves a must, much of it with wire fabric, to minimize slabbing and scaling.

• • **Future Mining Must Yield** maximum grade with complete extraction of each ore body. Cost cutting grows more important. Several new shafts will be needed for high production. All future shafts for hoisting will be circular concrete lined. Success of rotary drilled shafts will continue and may lead to drilling of 60-inch diameter circular production shaft. Ore body extensions will continue to be found by surface and underground drilling. The Westward Trend of production will continue and may even accelerate in the future.

Raise Tonnage To 235,000 Per Month

ROCK BOLTING WIRE MESH to support back and ribs is now done on wide scale to make slabby treacherous ground safe.

LONG HOLE PROBING speeded with portable self-powered oscillograph operated by Century Geophysical geologists.

Underground uranium mines in Ambrosia Lake have produced their first $100,000,000 worth of ore.

It's taken only a little over five years since the first discovery of uranium in cuttings from a dry hole drilled seeking oil near what is now the northern edge of the district.

While time has been short, by any other way you measure this production it has added up to many major mining problems, anxious times for financiers, and death and injury to many men.

Today the worst problems have been solved and peak mill production is just being attained—235,000 tons of ore per month with a value in excess of $6,000,000.

To reach this production it has required the sinking of 20 major shafts, driving over 100 miles of underground openings, drilling numerous ventilation and man shafts, development of entirely new mining and material handling methods, and drilling of several millions of feet of underground drainage and exploration holes. There of course has also been the drilling of thousands of surface exploration holes, the erection of four major uranium mills in the district, and all the necessary auxiliary facilities such as power plants, power lines, roads, housing etc. The borrowing of several tens of millions of dollars to finance all this was a major feat in itself.

The past year has seen an amazing improvement in mining methods, better application of equipment; and a more detailed knowledge of the location, grade, irregularities, and physical characteristics of the ore bodies.

With the stretch-out of mill contracts by the Atomic Energy Commission from 1962 to 1966 the most important event ever, for the district, has taken place. This is time—more time—to develop the mines, drain the ore bodies, and cut costs. This has been most important for management. The mad rush for production to keep the hungry mill running, to fill the sales contract, has now become secondary with the first consideration being given to lowering costs, cleaner mining, and complete ore extraction.

One of the district's mine managers, a man with world-wide mining experience, best summed up today's situation as, "Tricky mining. The irregular ore bodies, the sharp cut-offs, the high ratio of development to ore tonnage all make mining tricky." He added, "The challenge is to get the maximum dollars out of each ore body by preventing dilution, by figuring the best and most economical method to mine. Avoiding dilution is most important. If I can raise the grade only 0.01 percent it means a difference of over $40,000 in one month."

Another mine manager, while winning the daily battle against water inflows of 1,500 gallons per minute, the high rate of abrasion on pumps and mining equipment, and ground support, was emphatic about the importance of the two major problems. (1) Grade control which is so importantly a function of dilution, and (2) Cost cutting.

The following are the district trends as I see them. They are not representative of any one company. However, several companies may be striving for the same result with slighly different methods. In other cases only one company may be establishing what looks certain to grow into district trend.

Under ore bed development has been most important recent trend. Several of the earlier mines started this method. Today all major wet producers have adopted it as standard. This means that all main haulage is by regular ore trains operating on tracks. It is faster and cheaper to drive the smaller-sized tracked drifts in waste under the ore than to develop in ore. It is cheaper to transport ore by train to shaft than by off track equipment through small mine openings with wet bottom. The sublevel also has the most important advantage of preceding stoping.

Underground long hole drilling footage has upsurged greatly from the under ore bed drifts. Holes are used for drainage; and to locate, delimit, and sample ore bodies. A regular series of long hole rings fanned 150° around the back of the drift at 25, 50, or 75 foot intervals are drilled. Aside from physical problems created in handling undrained wet ore, the problems of probing (Geiger sampling) wet ore, and the loss of uranium values in the water, drainage is most important ahead of stoping because the rock becomes enormously more competent after it has dried up.

Pumping trend is to special pumps with excellent results. One mine is using SRL mill slurry pumps on its bottom level to transfer muddy mine drainage water into settling sumps which then feed clear water to the main mine pumps. Sand and slime are cleaned mechanically from alternating sumps.

At another mine a series of regular rubber lined mill pumps are used to

OFF TRACK DIESEL EQUIPMENT is favored for drier stopes where ore bodies are thick. Wagner mining mucker is popular.

SCRAM DRIFT under sublevel caving stope proves that ore will drain and can be mined by low cost stoping method.

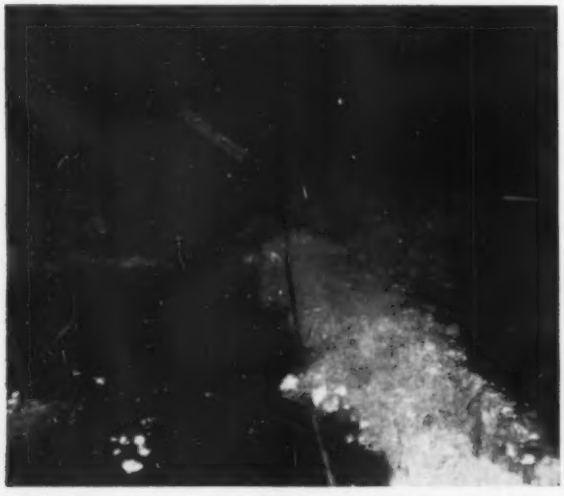
pump muddy water directly to surface without cleaning. The only sump cleaned at this mine is the shaft sump in which a bucket elevator operates continuously to discharge its load directly into slusher trench. Several mines use these bucket elevators. The trend is to all-steel elevators to replace rubber belts and steel buckets.

Installation of special high pressure Gaso piston pumps manufactured by the Gaso Pump and Burner Company of Tulsa, Oklahoma, has proved very satisfactory at one mine. Two other deep wet mines on the eastern end of the district are now installing these pumps. They have four 7¼ by 12 inch cylinders and are driven by a 250-horsepower electric motor. Two pumps in series are necessary to elevate 600 gallons per minute 800 feet to surface. Operation of these pumps has proved that greatly increased efficiency is attainable when they are fed by a high pressure head. Therefore, two 5,000-gallon sumps have been cut 100 feet above the bottom level and Flyght pumps are used to pump desanded water into these sumps. A 12-inch column leads down the shaft to serve as intake line for the Gasos. At this very wet mine the pumping set-up is more elaborate than at others. All mine water is first put through a 20-inch cyclone with underflow sand dropping into slusher trench. The overflow feeds a screw classifier from which overflow is pumped to main sump and sand drops to trench.

Thin ore stoping trend is toward electric slushers. The big reason for this is that it permits cleaner mining in the thickening and thinning ore beds. You don't have to break any waste when an eight-foot ore face thins to five feet in one round. One company is spotting transfer raises every 90 feet along strike, drifting through to the next raise driven from the advancing sublevel and then turning crosscuts at 30-foot intervals across the full width of the ore. The final mining of one of these typical stopes is to pull pillars retreating in the direction of sublevel advances. First, the closest crosscut to cave is slabbed and slushed to transfer raise. Succeeding crosscuts are then slabbed.

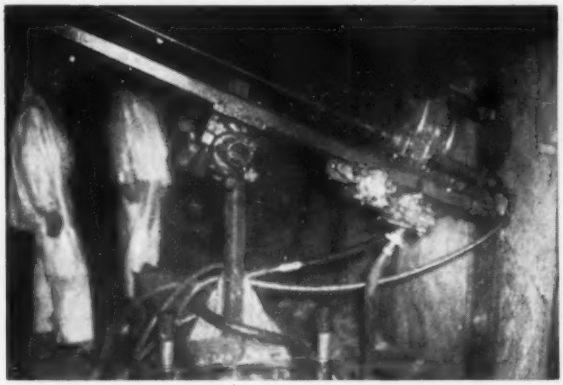
Thick ore stoping uses both cut and fill, and sublevel caving for the so called "stacked ore bodies" which are a distinct characteristic of mineralization on the western fringe of the Lake. One company is cutting and filling alternate layers of ore and waste with a total thickness of up to 100 feet. Rubber tired loaders are used in these stopes to transfer broken ore to ore pass raises, and to transfer and level waste fill. At times enough waste is broken in stope for fill, but the normal practice is to drop fill into stope through raise. The rubber tires compact the fill very tightly so no flooring is necessary to blast ore onto.

Another company has started sublevel stoping for all ore over 40 feet thick. Scram drifts are driven just in the bottom of the ore at 40-foot intervals. These are 7 feet wide and 6 feet high with staggered finger raises.



SLUSHING grows more popular for stoping thinner ore bodies. Many mines have standardized on three drum electric hoist.

ELECTRIC SLUSHERS grow in popularity for stope slushing to transfer raises. This is two drum unit; many are three drum.



UNDERGROUND LONG HOLING is used to drain ore beds, outline ore limits, and for Geiger probing for grade.

CHUTE LOADING replaces many mucking machine draw points. Chute with air operated door loads muck into car.

Raise tops are coned out and a cut-off slot is mined to the full width and height of ore. Drifts are driven at 25-foot vertical intervals in ore at right angles to scrams from which a series of long hole rings are drilled and slices blasted into the open stope. Electric slushers load ore from scrams into Diesel trucks for haulage to shaft.

Stope haulage to transfer raises grows in district for thicker ore. Diesel powered equipment is used only in stopes for mucking and transportation. Where the ore body rolls down to the top of sublevel drift the loaders discharge directly to cars; normally the drift is about 25 feet in footwall so that a transfer raise is necessary.

Swing now is to chute loading. Operators have developed two types of essentially leak-proof steel chutes with air operated gates to control muck and load trains. Main line haulage cars are the new Telluride type with one piece welded steel body.

Use of chutes is made possible primarily by the drying of the ore. The miners were glad to get away from the early mucking machine draw points because it meant that uranium values were washed into sumps with the slimes and the soupy muck flowed out onto haulage tracks and plugging draw ditches.

Rock bolting is growing trend. Great emphasis is being placed on bolting of wire fabric in all openings over 10 feet wide. This means all junctions in stopes, and drifts. Special crews are preferred for bolting. They use a special air wrench with adjustable torsion setting to uniformly tighten all bolts. Use of bolts is shown by the fact that one company which mined 51,150 tons of ore in one month used 18,165 six-foot bolts.

Underground long holing is a major factor in mining today. One company drills one foot of this type hole for every two tons of ore mined. About 40 percent by Leyner and the rest with AirLeg machines. Non-coring diamond drill holes are also used extensively for very long holes in wet mines well ahead of initial development. Most mines regulate rate of such development and long holing to the pumping capacity. Air powered rotary auger drills using twin pointed bits yield fast hole drilling rates.

Underground probing of these long holes is now done more accurately with a new battery powered oscillograph recorder. The trend has been to contracting this probing work to the same firms which did so much of the surface hole logging. Century Geophysical Company has a number of geological crews logging all underground holes for one company.

Ambrosia Lake's been a tough district. It will continue to be tough to make some mines pay out. There's more uranium there than can be mined through 1966. The rate of mining progress in the last year augurs well for the future. It's a major mining district by any standard. END

BLACK JACK No. 1 mine of Lance Corporation yields 700 to 800 tons per day.

SLUSHER TRENCHERS are used to load skips at all wet mines.

ROTARY DRILLING of round ventilation and man shafts is increasing.

WET SCREENING . . . . Finnish method

"By wet screening wet coarse ore, either before it is crushed or within a proper place in the crushing circuit, excellent feed characterized by low and consistent moisture can be produced for any type of dry processing.

"Within the coarse size range, the major source of moisture appears to be the inherent moisture of the primary rock itself, with decreasing particle size, other forms begin to dominate the picture.

"Actual drying can thus be either eliminated or reduced to the drying of a small fraction of the ore, or of a concentrate produced by removal of the slime fraction by wet methods.

"The capital and operational costs should be substantially lower than in conventional practice where the irregular moisture content is corrected or eliminated by drying."

R. T. Hukki, J. Tanila, and O. Korhonen, Institute of Technology, Helsinki, Finland

Dry processing of mineral raw materials is becoming increasingly attractive in a number of fields, especially in magnetic separation of minerals. While the separation process itself may be easily solved, difficulties often arise from the very nature of the mined ore itself, especially from its inconsistent and excessive moisture content which is detrimental for grinding, for sizing, and for separation steps. The well known and widely practiced cure is drying of the entire raw material. This, however, is an expensive undertaking both in capital and in operational costs.

The amount of moisture that can be tolerated depends on the material and on the process. No generally valid figures seem to be available. It should be realized, however, that a dry grinding process performed without dry classification and without air circulation has only a slight reducing effect on the moisture of the material ground. The principal carrier for water is air blown or drawn through the grinding unit. Its drying capacity increases with increasing volume, increasing temperature, and increasing degree of unsaturation. Various sources indicate that a moisture content up to 0.5 percent by weight will not be harmful in most dry grinding, classification, screening, and magnetic separation. In some cases, even substantially higher figures may be tolerated without difficulties.

It may be well known, yet surprisingly little appreciated, that the unbroken ore "in situ" is generally very dry. The broken ore, however, with greatly increased surface available absorbs and locks mechanically water which is amply available in most underground operations. As a result, the average moisture content of the ore hoisted is normally many times, even 10-fold, higher than that of the primary rock itself.

To find out to what extent various size classes of broken minerals can retain water, standard screen fractions of magnetite ore, hematite ore, and crystalline limestone were separated. Large samples of each size class were introduced into a container provided with a woven 200-mesh conical screen bottom and washed with ample quantities of water. Zero time was taken as that moment the continuous free flow of water through the screen stopped. Water draining thereafter, drop by drop, was collected and weighed at predetermined time intervals. Experimental values obtained after 30-minute draining are shown in Figure No. 1. A smooth curve is drawn to show the general trend of how the amount of water held by the fractions studied varies with particle size.

Water held by screen fractions depends strongly on the fineness of the material. In size classes finer than about 1.0 millimeter, the moisture content varies but slightly and corresponds closely to the dilution obtainable for thickened finely ground pulps of the respective materials. Experimental values were found to be between 20 and 30 percent of water by weight based on the moist sample. In size range from 1.0 to 100 millimeters the moisture content seems to decrease at a constant rate, which is inversely proportional to the particle size. Within a size range larger than 100, the moisture content is practically indepndent of further size increase and corresponds closely to the original moisture content of the primary rock. In Figure No. 1 this minimum is shown to be 0.2 percent water. This value is based on two series of determinations made at two Finnish mines: For an iron ore, the average was found to be 0.15 percent; for a sulphide ore 0.25.

Within the coarse size range, the major source of moisture appears to be the *inherent moisture* of the primary rock itself. With decreasing particle size, other forms begin to dominate the picture. With increasing specific surface, the share of the so-called *surface moisture* increases in direct ratio to the surface available. One of the special properties of this surface moisture is that it is so tenaciously absorbed on the mineral that temperatures well

eliminates ore buying prior to processing

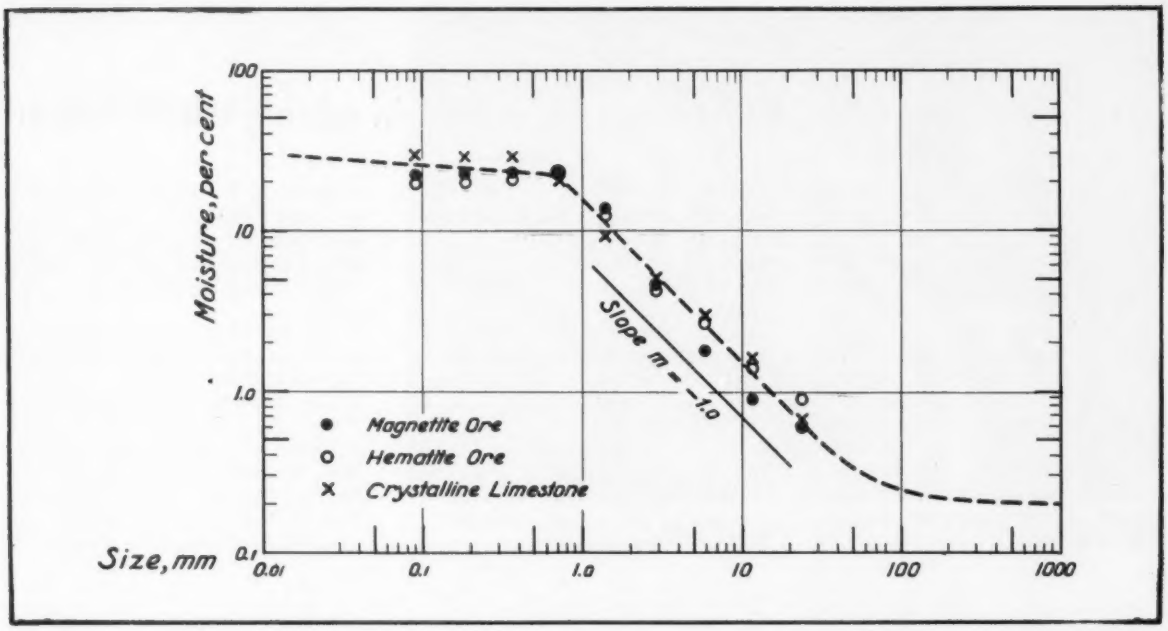


FIGURE NO. 1. Moisture characteristic showing fundamental relationship between particle size and the amount of water held by various screen fractions. Draining time for all experimental points on curve is 30 minutes.

over 100° C are required for its evaporation. In addition, the opportunity for *capillary moisture* increases also with decreasing particle size. High surface tension prevents capillary water from draining. Larger pores and cavities are filled with *non-capillary water* which is momentarily held by the solid bed but is capable of draining away when given time.

From the moisture characteristic shown in Figure No. 1, it is apparent that the moisture content of broken ores can be strongly reduced by separation of the fines. In view of the fact that the moist slimes adhere tenaciously to the larger pieces, the only effective way is by wet screening, or by wet scrubbing. Strong water sprays or complete immersing into a water bath will aid in dispersing the slimes. By such a treatment, a coarse, rapidly draining fraction is obtained with very consistent and low moisture content as a separate product. The pulped slimes may be thickened, ground and processed separately in a parallel wet circuit to produce a wet concentrate, which may be dried in a separate small dryer if necessary.

For wet screening use scrubbers or screens with water sprays

Actual moisture content of the coarse fraction depends on the point where the cut is made. In Figure No. 2, two examples are given based on the moisture characteristics shown in Figure No. 1 and on the assumption that the size distribution of the treated product is represented by a straight line having a slope of 0.8 on a logarithmic paper. As indicated, moisture content in a washed product representing a size class between 5 and 100 millimeters is 0.6 percent water. If the lower size limit is set at 1.0 millimeter, the moisture increases to about 1.0 percent. In the earlier case, recovery of the ore in the coarse fraction would be about 91 percent; in the latter, 97.5. All figures are improved by treating the material in a coarser stage. They will also be reduced by longer draining times with or without such auxiliary features as natural or forced ventilation through the bed in storage. In cold climate, freezing of the washed coarse fraction will not cause additional difficulties.

For wet screening process described above, heavy duty wet scrubbers or conventional screens equipped with water sprays may be used.

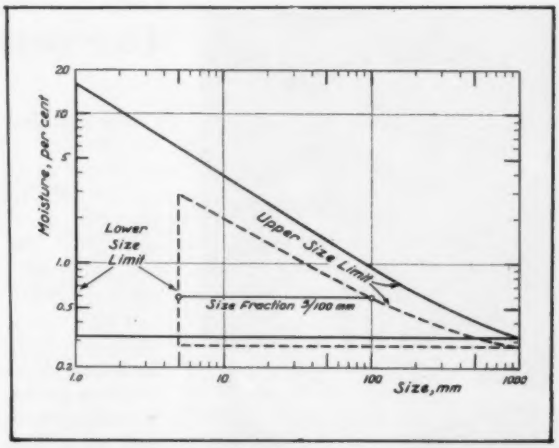


FIGURE NO. 2. Relationship between coarseness of separated product and amount of water held. Triangular diagrams plotted to represent industrial applications. They are based on moisture characteristics in Figure No. 1 and on a slope distribution.

Unusual Corkscrew Adit Develops Zinc

Tri-State Zinc Company shows ingenuity in mining the Bowers-

Tri-State Zinc Company pioneered direct Diesel truck haulage from the underground stope face to the surface mill bin through long inclined adits. The company also pioneered a type of shrinkage stoping for relatively thick but flat-lying tabular ore bodies.

These important mining developments were made just 10 years ago at Tri-State's Bautsch zinc-lead mine in the Galena, Illinois district. Tri-State Zinc was one of the first companies to use mechanized off-track loading and haulage equipment underground and to completely Dieselize this equipment.

More than 10 years of mining have proved the safety, versatility, tonnage flexibility, and low cost which can be achieved by using this type of mining equipment and methods for shallow, bedded, flat-dipping ore bodies.

It's no wonder that Tri-State's management have applied these principles and methods in developing and mining the Bowers-Campbell zinc ore body at Timberville, Virginia.

The surprising thing is that this mining method has been most successfully applied to the development and mining of a much different ore body—different in shape, size, and attitude. This is the Bowers-Campbell ore body, which is a nearly vertical mass 700 feet long, up to 100 feet wide, and up to 475 feet deep, cutting sharply across the 30° dipping dolomite country rock.

The one thing in common to the two separate ore bodies, and the most important from a mining standpoint, is hard competent ore and wall rock.

The Bautsch ore; galena and sphalerite cements dolomite and limestone of Middle Ordovician age. The Bowers-Campbell ore: sphalerite, traces of both galena and pyrite, with white vein dolomite, and minor quartz

Inclined spiral adit is a series of inside and reverse loops with

Surface diamond drilling of both vertical and steeply-inclined holes was used to outline and delimit the margins and bottom of the ore body. Assaying of cores from the 60 holes indicated grade of ore. In general, assay walls were found to be fairly sharp so that no great extensions of low grade material were present. From these data, the ore body was plotted on a map and the mining limits marked.

Location of the 10 percent dipping inclined adit was then plotted with the following limitations. Total depth, or vertical height, of ore to be developed was 475 feet, which meant that 4,725 feet of 16 feet wide by 14 feet high adit would have to be sunk. Also, that the incline would have to be positioned so that five horizontal levels at 80-foot vertical intervals could be driven to reach the ore body in the shortest waste distance. Further, that all curves would have to be on a 45-foot radius. Another specification was that the collar would have to be close to the mill's coarse ore bin. The final limitation was that the adit be driven on company property.

These requirements meant just one thing—a cork screw or spiral-like pattern with levels stacked one above the other. Fortunately the rock is hard and there has been no problem of any kind by rock failure or caving. The incline is sunk in the footwall of the ore body. The bottom of the in-

JUMBO with two Ingersoll-Rand D-35 machines is mounted on an Allis-Chalmers HD-5 tractor for mobility.

Low cost mining by modified open stoping

The modified open stoping-shrinkage stoping, with necessary pillars, developed at the Bautsch mine proved so low-cost, recovered all ore, and produced a high tonnage per man shift, that the same method was adopted to mine the Bowers-Campbell ore body. While the same general plan was followed, it was necessary to develop the mine so that a series of horizontal drifts and stopes could be cut from the ore body. In reality, this is analagous to the layers of a cake with each layer corresponding to an independent open stope. The important thing in first mining is that floor pillars are left between these stope slices.

A vertical projection through the ore body shows this plan developing as follows: Establish levels at 80 foot vertical intervals by driving from spiral incline; carry 15-foot high headings for full use of mechanized equipment to mine a flat layer out of ore body. This leaves a 65-foot high pillar to next level. A second layer is then mined by benching from the first slice by vertical drilling and blasting a 25-foot high bench round. Ore is loaded and hauled up incline. Now the original floor pillar has been cut in half to a 40-foot thickness. Vertical benching will then follow to remove

Mine To 700 Foot Depth

Campbell ore body

and calcite, occupying a shatter breccia zone in the Upper Beekmantown (Ordovician) dolomite. The upper section of the ore body is offset to the west by a bedding plane fault. The ore body strikes N. 34° W. to parallel the strike of the enclosing strata which dips 30° southeastwards.

The ore and dolomite wall rock stand unsupported over widths of 50 feet and heights to 100 feet. After careful scaling of the back of the top heading, which first becomes and then remains the open stope back, there is no sloughing or cracking of the back.

BACKSTOPING with air leg stoper to open large face for jumbo drilling. Jumbo could operate here, but is more productively used drilling regular stope face.

a 10-percent grade in the footwall of the ore body

cline is only 160 feet horizontally away from the collar. However, to travel down the incline one successively makes three complete inside loops, one reverse loop, two inside loops, and one reverse loop. There are several places in the incline where there are five levels superimposed exactly above one another—but not necessarily succeeding loop upon succeeding loop.

The incline has proved a success in every respect. It offers great flexibility in stoping, as hauling from any one of the four levels is completely independent. In fact, one Dumptor hauls from several levels during a shift. Ore is hauled quickly and cheaply by one man from stope faces to the mill bin without any transfers or rehandling. Crushed rock is used to maintain a firm road base.

In only one place is the incline more than 100 feet from the edge of the ore body and is virtually alongside the ore at points where levels start.

The underground water level was lowered ahead of sinking by deep well pumping through churn drill holes. As much as 400 gallons per minute were pumped in this manner.

In sinking, the full face was drilled with a three machine portable jumbo. An Eimco 105 loader mucked broken rock into Koehring Dumptors for transportation to the surface. This same equipment is used in stoping.

—shrinkage stoping method proves effective

this floor pillar between room pillars.

Now taking a horizontal projection through one of the levels, the mining plan call for alternating 50-foot wide rooms and 25-foot wide pillars. Pillars are positioned at right angles to the strike of the ore, and carefully spaced so that pillars are superimposed one above the other from the top to the bottom level.

Actual mining is by driving across full width of ore from the incline. Drifts are then turned in both directions along the foot wall. From these drifts, rooms are slabbed out across the width, leaving planned pillars.

This first mining—initial 15-foot high heading plus the 25-foot high benches—removes about 40 percent of the ore in each 80-foot-thick slice.

The next step is to take out the 40-foot thick floor pillar by vertical benching to recover an additional 40 percent of the ore.

Pillar recovery will be the final mining step. Crosscuts will be driven through pillars, the stubs will be drilled and blasted, dropping ore to lower level and retreating toward the incline. To keep men and equipment under safe backs, this final pillar retreat will necessitate slushing of ore from open stopes back to the safety of a pillar where it will be loaded and hauled up incline.

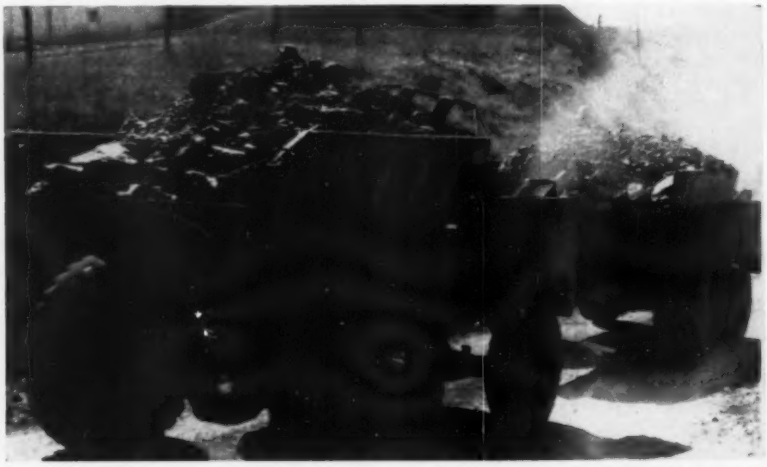
Ventilation is important in this multi-level mine. Accordingly, fresh air is blown from surface down a series of vertical connections in the ore body and circulated through the stopes before exhaustion up the incline. This has two advantages: Fresh air reaches stopes first and the constant positive pressure in the system sweeps all smoke up the incline; no smoke is ever circulated through mine, no matter how much hauling is done through incline.

Bulkheads to direct the air flow are built from wire mesh fabric covered with burlap. These bulkheads move slightly with blasting concussion,

whereas the timber bulkheads first tried proved so rigid that they were blown out.

Actually these ventilation connections are through the floor pillars. A Gardner-Denver D 99 Air Trac crawler drill is used to drill 3½-inch-diameter vertical down holes, 20 to 65 feet deep, using Gardner-Denver sectional drill steel. A five to seven hole burn cut is first drilled and two rings of holes around it. Short rounds are loaded with 40 percent Atlas Gelodyn and blasted electrically so that the entire connection is broken at one time. The longer ventilation openings must be shot in sections, usually five foot rounds starting from the bottom; at times succeeding rounds can be loaded from muck pile, but as raise gets longer, the powder must be lowered into the drill holes from the top for the blasting of the lower section.

KOEHRING ¾ cubic yard Diesel shovel loads Dumptor in open stope.



TWO MORE LOADS of zinc ore emerge from long adit of Bowers-Campbell mine. Dumptors haul an average of 10.5 tons.

Efficient use of equipment gives high tonnage per man shift

Crosscuts and drifts are drilled with jumbos and broken ore loaded into Dumptors with an Eimco 105 loader. The same jumbos, one two-machine mounted on an HD 5 tractor, and one three-machine truck-mounted, are used for slashing stopes. A Koehring ¾-cubic yard Diesel shovel is used in the stopes. It has high loading capacity, but is not as maneuverable as the Eimco, and requires more headroom to operate. The shovel loads about 70 percent of tonnage and the front-end loader the remaining 30. Truck loads average 10.5 tons.

Two men on a jumbo drill up to 40 11-foot deep holes per shift. The Ingersoll-Rand D 35 machines are mounted on 11-foot long sashes so that one steel (1⅞-inch diameter) drills entire hole. Tungsten carbide bits are used exclusively; 2-inch bits for the jumbos and 2⅝ for the Air Trac.

The bench round is drilled with a Gardner-Denver Air Trac. Atlas powder is used for blasting, 1⅛ by 20-inch sticks in headings and 2 by 20-inch for bench round.

Electric caps are used exclusively with millisecond caps, yielding best fragmentation on the bench shots. In a typical month, 1,600 holes are loaded and blasted with 12,460 pounds of powder for a factor of 1.34 tons per pound.

All mine water is collected in a sump and pumped through a 440-foot deep churn drill hole to the surface. Average pumping rate is 400 gallons per minute, which is used for mill water.

A crew total of only 28 men mines and mills an average of 750 tons per day, at a total mining and milling cost of $1.70 per ton. This is 26.8 tons per man shift. Tonnage per machine shift varies per day from a low of 138 to a high of 227 during a month.

The crew distribution follows for mine opeating one shift and mill three shifts per day for a 22-operating-day month:

	MINE
1	Superintendent
2	Loader operators
4	Dumptor drivers
5	Drillers
1	Powder man-roof trimmer
13	
	SHOP
2	Mechanics
1	Electrician
3	
	MILL
2	Crusher operators
6	Flotation operators
1	Superintendent
1	Concentrate hauler
10	
	OFFICE
1	Clerk-warehouseman
1	Manager
2	
28	TOTAL

The mining and milling costs over a ten month period were $1.70 per ton, distributed as follows: mining, $0.89; pumping, 0.06 and milling, 0.75. Mining cost breakdown was $0.20 for drilling, 0.21 for blasting, 0.13, loading, 0.20 for haulage and 15¢ for miscellaneous.

It is anticipated that these costs can be maintained for the life of the ore body and quite probably reduced, as a higher tonnage of ore will be removed once the mine levels have been fully blocked out. END

High-Speed Bucket-Lines

boost capacity of South American dredges and feature manual control of a. c. hoist

By C. M. Romanowitz

The South American Gold and Platinum Company and its subsidiaries have expanded dredging operations in Colombia, South America while many other companies have reduced their operations.

Improvements and important changes on the dredges during the past few years have increased production, making possible continued operation despite rising costs. In addition to these improvements and changes on the Colombian dredges, the company has recently completed the equipping of another property in Bolivia for dredging gold placers under conditions that have taken extreme foresight and resourcefulness to bring into production.

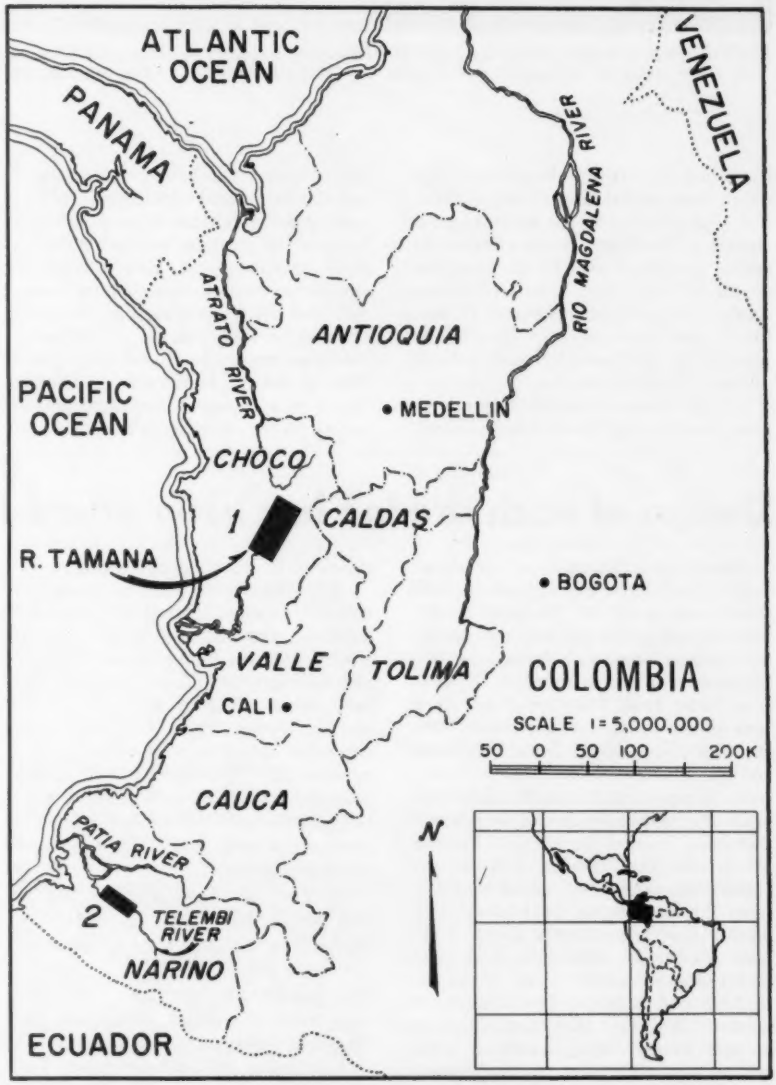
Since July 1954, this company has been under the leadership of L. B. Harder, president, and P. H. O'Neill, executive vice president (in charge of mining operations). South American Gold and Platinum, through its subsidiaries, is mining gold and platinum placers with bucketline dredges in the departments of Choco and Narino in Colombia, South America. These dredging fields are shown on the accompanying map.

Six dredges are presently being operated in Colombia by the company's two wholly owned subsidiaries. One subsidiary, Compania Minera Choco Pacifico, S.A., operates four dredges and produces platinum along with a substantial amount of gold in the Choco district. Another subsidiary, Compania Minera de Narino, produces principally gold in its operations in the Narino district and operates two dredges.

These six dredges, one of which (No 1) has been operating since 1915, have made a record worthy of the highest praise in the placer mining industry. This record has demonstrated the high quality of the dredge equipment used and reflects good management and courage over the 45 years since the operations were started.

The dredge buckets vary in size from 5 to 13 cubic feet capacity. Digging depths range from 34 to 65 feet below water level. Three dredges, No. 1, No. 2, and No. 4, are working on headlines, while the other three use spuds, although all are equipped to use headlines if the conditions call for this.

Dredges which use headlines generally work under conditions where



DREDGING AREAS of South American Gold and Platinum Company's subsidiaries. In area 1 at top Compania Minera Choco Pacifico, S. A. operates four dredges and recovers substantial platinum. Compania Minera de Narino operates two gold dredges in area 2.

Mr. Romanowitz is Ellicott Machine Corporation's Pacific Coast division sales manager, San Francisco, California. Ellicott is the successor to the floating dredge business of the Bucyrus-Erie Company and offers complete engineering, sales, and repair part service.

DREDGE NO. 6 was originally designed for 8 cubic foot buckets with a line speed of 35 buckets per minute. Capacity was later increased 51 percent by increasing bucket size to 11 cubic feet while reducing line speed only slightly to 32 buckets per minute.

there are no banks ahead. In some cases, low banks have been worked, but whenever banks are present, great care must be taken by the leverman which usually results in the lowering of the yardage dug. The Colombian dredges have worked banks of 15 feet to 20 feet, and recently No. 1, the smallest of the fleet, has had a bank of over 25 feet ahead of it.

All six dredges started their operations in the river areas where dredging, at times, was severe due to rapid and extreme flood conditions, and, in some cases, boulders or hard bedrock. Later most of them worked adjacent areas consisting of flats or playas where the formation was more favorable, but dredging is still handicapped at times by high bedrock, high banks, boulders, sunken logs, and large quantities of debris. In the Choco district, No. 4 is working in the river and is encountering tough bedrock conditions with many large boulders and frequent delays due to flash floods. Dredge No. 1 worked in the river in the Choco district until early 1957 when it completed its operations and the decision was made to move it to the Narino district. This was a major undertaking which is described below. Dredge No. 5 in the Narino district is working adjacent to the river and the conditions at times are similar to those found directly in the river.

Design of each dredge has been altered to suit conditions

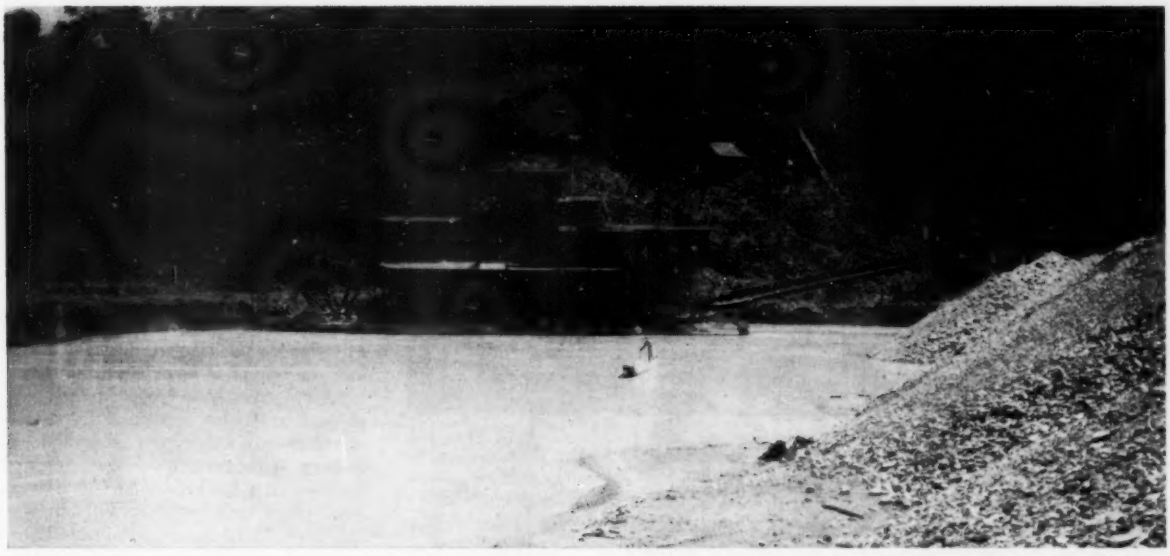
Outstanding features of dredges:

(1) They have high-speed bucketlines running up to 35 buckets per minute, using only alternating current and manual standard drum controls. These speeds are as much as 75 percent faster than those used on other bucketlines using such controls. There are other high-speed lines but these are operated with Ward Leonard controls, where the leverman does not have the responsibility of regulating the speed to meet the extreme varying conditions. One dredge, No. 4, decreased its bucketline speed in 1958 from 34 buckets to 24 buckets per minute due to extremely severe bedrock conditions. However, it is prepared to increase the speed to the 34 buckets per minute when conditions warrant. The fact that these dredges operate under these conditions with no serious difficulties or accidents caused by the high-speed bucketlines speaks well for the equipment, the operators, and especially for the management in selecting operators.

(2) Table No. I shows the record of the six dredges, giving their bucket capacity, the changes in the size of the buckets, the bucket speed changes, and the resulting hourly digging record, all of which is outstanding. To my knowledge, there has been only one other operation where two dredges substantially increased their hourly yardage record over their operating life and this was due to increasing the bucket size with only a slight increase of bucket speed.

(3) Two of these dredges, No. 1 and No. 5, have been operating the bucketlines with one train of gears for the main drive. This also is unusual for bucketline dredges, although equipment in other industries demanding much more horsepower has and is using this arrangement. The record is good and no difficulties have been encountered on account of this type of drive. This speaks well for the design, including the selection of proper gearing and foundation underneath the gearing.

(4) These operations overall were continuous, even under extreme difficulties and interferences. Dredge No. 1, in the early 1920's, was the victim of disputes over titles. During this dispute, some people who claimed possession of an island in the river cut the headline of the dredge which was anchored on the island. The dredge capsized but was righted in a short time and put back into operation. This dredge was beached in 1944 and remained out of operation until 1949, when it was overhauled and resumed operations, and worked until the spring of 1957 when it completed the gravels available for it in the Choco district. It was then decided to move it to the Narino district; a project of major proportions. While it was being moved to a point for overhauling, an accident occurred causing it to sink,



DREDGE NO. 4 is working up Tamana River, digging at times in the river and at times in adjacent playas. River dredging is generally more difficult due to boulders and hard bedrock than playas. For this reason bucket line speed is varied.

but it was raised and towed to Andagoya, the base of operations in the Choco district, where it was repaired, reconditioned, and modified for service in the Narino district. After this work was completed, it was floated down the San Juan River to the Pacific Ocean and thence to the mouth of and up the Patia River to one of its tributaries, the Telembi River.

Many Problems Solved

Dredge No. 2 sank in December, 1936, and was considered a total loss. The insurance was paid. About two years later the river changed its course and left it in a dry area. The dredge was purchased from the insurance company and a large number of natives, mostly women, were put to work digging the sand out of the hull by means of passing filled bateas from hand to hand along a long line of women. It was refloated in April, 1939, completely overhauled, and resumed operation in August, 1941.

Dredge No. 5's operations have been on the Telembi River, the main branch of the Patia River. It is subject to flash-type floods throughout the year; the average rainfall is 300 inches and a 30-foot overnight rise in river level is not unusual. As an example, in October, 1958, in 18.5 hours the river actually rose 35.9 feet over the normal level of 3.2 feet. Dredging under these conditions is extremely hazardous. The dredge has been stranded high and dry three times. During one flood in 1948, heavy current and trash broke the two stern lines and one bow line, leaving the dredge swinging back and forth across the river on the headline as the ladder would not reach the river bottom due to the high flood conditions. The operating crew, realizing the taut headline could break at any moment and leave it at the mercy of the current, followed the traditions of the bucketline dredge industry in remaining aboard and working superhumanly until they were able to string out other cables to take the place of those lost. This is an example of courage, good management, and high loyalty of employees.

A further example of these operations is indicated by the overall production of the two companies. Their accumulated totals as of December 31, 1959 in Colombia were over 480,000,000 cubic yards from which 910,000 crude ounce of platinum and 1,790,000 ounces of gold have been recovered. The gold has averaged about 850 fine and the platinum about 870 fine.

First Diesel Electric Power

The record of each dredge is of interest. No. 1 started operations in the Choco district in 1915 using a 6-cubic-foot open link Lobnitz bucketline with power generated by a wood burning steam system. This dredge was electrified in early 1927 using a 3¾ cubic foot Bucyrus closed bucketline with machinery changes to suit. As the accompanying Table shows, the buckets were changed to a capacity of 5 cubic feet each and the speeds changed from 26 buckets per minute in 1927 to 33 in 1950; it is now operated at the same speed. Its increase in hourly yardage from 61 cubic yards in 1915 to 226 yards in 1957 is outstanding. This represents an increase of 270 percent.

No. 2 was designed by the Bucyrus Company with the machinery units furnished by Bucyrus. The hull and some structural steel were furnished by other firms. The construction of this dredge started in May, 1917, but evidently due to World War I conditions, it was not completed until 1920. The original bucket capacity was 5½ cubic feet, with a digging depth of 34 feet below water level. The power was from a Bolinder "Half" Diesel engine generating electricity aboard the dredge. It was the first Diesel-electric powered placer dredge. In January, 1925, it was the first of these dredges to be electrified, receiving its power from a shore source. Over its life, the bucket capacity was increased from 5½ cubic feet to the present capacity of 7½ cubic feet, and the bucket line speed changed from 26 to 35 buckets per minute, resulting in an increase of 433 cubic yards per hour or a 286 percent increase. Here, as on No. 1, it was a management problem to determine the economics of the increased yardage and if the larger load on the recovery system resulted in more profitable operation.

No. 3 was also designed by the Bucyrus Company with machinery furnished by them and the hull and structural steel by other firms. It started operating in 1924, with buckets of 8 cubic foot capacity, later changed to 12, and then to 13 cubic foot. It was originally a slow-speed line but was speeded in 1929 to 28 buckets per minute. The dredge was

138 PERCENT CAPACITY INCREASE was obtained from dredge No. 3 by changing from 8 to 13 cubic foot buckets and increasing line speed to 28 buckets per minute. The dredge was originally powered by a turbo-electric system, later was completely electrified.

originally powered by a turbo-electric generating system and later was fully electrified with power from a shore source. The capacity of the dredge was increased 390 cubic yards an hour, a 138 percent increase.

About the time that construction of No. 4 was being considered, P. R. Parker, an outstanding placer dredge engineer who had been with the Bucyrus Company and the Yuba Construction Company for many years, joined the South American Gold and Platinum Company and was responsible for the designs for No. 4, No. 5, and No. 6. He had also designed No. 2 and No. 3 while with the Bucyrus Company. I happened to have known and was associated with Mr. Parker for many years, and I am pleased to mention here the great contribution he has made not only to the design but to the manufacture of many placer dredges. Mr. Parker is now retired and living at Kennebunk, Maine.

The machinery for No. 4 was manufactured by the Bucyrus-Erie Company with buckets of 8 cubic foot capacity. It was built in 1932 and operated in the Atrato River in Colombia. After working out the gravels in that area, it was towed through the Panama Canal to the San Juan River in the Choco district. This dredge has been ascending Tamana River digging at times in the river bed and at times in playas adjacent to the river. Generally the river dredging is more difficult, due to boulders and hard bedrocks, than the playas. For this reason it has been their practice to vary the speed of the bucketline between 34 and 20 buckets per minute by the use of two different diameter pulleys on the main drive. At the present time this dredge is working in the river and is making use of the slower bucketline speed, that is 24 buckets per minute. This resulted in a decreased capacity of 169 cubic yards per hour or a 40 percent decrease. As this dredge works on a headline, it is not as capable of digging in hard formations as if it were equipped with spuds.

The main machinery for No. 5 was furnished by the Bucyrus-Erie Company with other parts from various companies in the United States where the dredge was erected. It began its operation on the Telembi River in the Narino district in 1937. The bucket capacity is 12 cubic feet, the same as originally equipped. The dredge is powered by a three-engine Diesel electric power plant aboard. Its digging depth is 65 feet below water level, the greatest of all the dredges of this company. Operation was started making use of a headline; although it was equipped for spuds, they were not installed until sometime later.

The operations have been hazardous due to high and swift water. This accounts for the slower bucket speed and relatively small yardages shown in Table No. I.

No. 6 was the last dredge added to the Colombian fleet owned by the company. It is very similar to No. 4, but incorporates certain changes and modifications which were dictated by experience and requirements for the area in which it was to work in the Choco district. The main dredge machinery was also furnished by Bucyrus-Erie with other parts supplied by various companies in the United States. The bucket capacity was 8 cubic feet, and to start with had a speed of 35 buckets per minute. The buckets were changed later to 10½ cubic feet and then to 11 cubic feet. When the bucket capacity was increased, the bucket speed was decreased to 32 buckets per minute. However, the table shows, the yardages increased 218 cubic yards, or approximately 51 percent. The increase was due to, in part, the increased bucket capacity and improved efficiency. It has been operating electrically with power from shore since its start. In 1957 this dredge was overhauled and modernized, with the installation of a modern treating system making use of jigs, the installation of a spud and other changes. These modifications increased the efficiency and also the recovery as more fine platinum and gold have been obtained than prior to the installation of the jigging system. The experience with this modern treating system makes possible an economical determination concerning the use of jigs on the other dredges, considering also the remaining life of the property.

The outstanding record of these dredges is further indicated by the fact that in recent years the running time has averaged slightly less than 84 percent which is remarkable under the condition encountered.

Men who developed dredging techniques in South America

The above covers many of the dredging activities of this company, but the record would not be complete without due consideration to the personnel responsible for the results. Mr. E. H. Westlake of the Lewishon group was the leading person in determining the mining possibilities in Colombia and later in deciding to carry on the operations which called for a continuing changing program in the acquiring, testing, and equipping of the properties as well as the political and business contacts with the local population and government officials. Another company, a British organization, had two dredges installed in certain parts of the Choco district. Through legal procedures difficulties with this company were settled in favor of the South American Gold and Platinum Company's subsidiaries. Close contact has been kept with the government and others relative to maintaining the company's position and carrying on a continual dredging operation. This is covered by an excellent paper entitled

"Platinum Mining in Colombia" by P. H. O'Neill in the May, 1956 issue of *Mining Engineering*.

Mr. Westlake was fortunate in having the assistance of N. C. Marshall who contributed a great deal to the success of the undertaking. Mr. Marshall went to Colombia first as a mining engineer, then advanced to manager and finally president of the company. He was an authority on Colombian law, and spoke Spanish fluently, in addition to being an outstanding engineer and manager. His trips to the property were hazardous, and on one trip his plane was wrecked in the jungle and all on board were given up as lost. However, after approximately a month, Mr. Marshall, although badly injured, with his knowledge of the jungle and of what to do to survive, miraculously made his way to help and eventually recovered from his injuries.

Another member of the Colombian staff was William Avery. He was outstanding in his handling of public relations in Colombia, knowledge of the language, in prospecting, and selecting properties.

C. E. McKay, after a well-balanced, thorough training in all phases of dredging, joined the staff in Colombia and was in full charge of operations over a two-year period prior to Mr. Harder taking over control. Mr. McKay was responsible for important and efficient changes in the operating personnel and for starting improvements in the dredge equipment with resulting increases in yardages dredged. P. H. O'Neill was assistant to C. E. McKay for a period of about a year. Control of the company was taken over in 1954 by L. B. Harder with P. H. O'Neill as executive vice president in charge of the mining operations and they have been responsible for the changes and improvements made since that time.

Early Day Gold Culture

The areas where these dredges have worked have been mined for placer gold since ancient times. As in Peru, it has been established that gold has been mined for an undetermined number of centuries. The evidence of this pre-historic mining is in the form of gold artifacts found principally in ancient graves. Another phase of the gold placer mining of many centuries ago in Colombia is indicated by the use of gold for articles of ornament and utilitarian purposes. One of the most widespread uses was for fishhooks and thousands of these fishhooks of all sizes, without barbs, but with and without eyes, have been recovered by dredging and other placer mining operations. There seems to be no historical record wherein the actual dates of the ancient placer mining operation were carried on. According to Biblical records, second chapter Genesis, verses 10 to 12, tells the first records of placer gold from a location that has been determined to be in Turkey, adjacent to the Black Sea. Other records show the first organized placer gold mining operations were in Greece, Northeast of Salonica by the Phoenicians in the 15th Century, B.C., after having captured these placers which were previously worked on a smaller scale. (Reference: "History and Geology of Ancient Gold-Fields in Turkey", by Leon Dominian; *AIME Proceedings*, Vol. XLII, 1911.) Whether gold was mined in Colombia before these recorded times is a question.

Further, as far as known, the platinum was always considered useless material until the 19th century. It was separated from the gold and discarded and when its true value became known a great effort was undertaken to work the locations where it was discarded, even moving houses, etc. The dredges, at times, working into these unknown dumps produced large quantities of the platinum. During World War I, due to a drop-off in the platinum mining of Russia, Colombia became No. 1 producer of placer platinum. Today, as far as the writer can determine, there are only three large placer producers of the platinum group, the U.S.S.R., the Goodnews Bay Mining Company's operation in Alaska, and the operations in Colombia. As the dredges complete their operations in the Choco district, the platinum coming from Colombia will constantly decrease.

When we see the placer production by dredging, especially of gold and platinum, diminishing, it is worthwhile to consider what is being done by the South American Gold and Platinum Company and its subsidiaries in Colombia and Bolivia.

Michael A. Burke, is manager of Cia. Minera Choco Pacifico, S.A. and Myron B. Phelps is manager of Cia. Minera de Narino. END

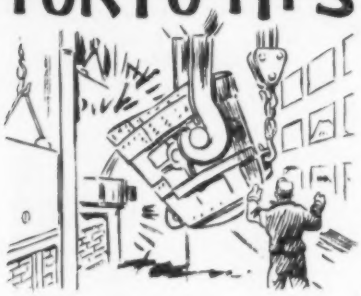
TABLE NO. 1

Production Data For Compania Minera Choco Pacifico, S. A., and Compania Minera de Narino, Colombia, South America

Years	Bucket size cubic foot	Buckets per minute	Yearly average cubic yards per operating hour: Theoretical capacity	Yearly average cubic yards per operating hour: Actual production	Percent of change in actual production from start of dredge
Dredge No. 1. Built 1915[1]					
1924	6-Open Connected	—	—	61	
1927-1928	3½	26	200	140	
1929-1932	3½	30	230	150	
1933-1944	4½	32	320	188	
1944-1950		Out of commission			
1950-1958	5	33	365	226	+270
Dredge No. 2. Built 1920[2]					
1927	6	26	345	151	
1928	6	30	400	195	
1928-1931	6	34	450	273	
1932-1936	7	34	525	346	
1936-1941		Out of commission			
1941-1954	7	34	525	346	
1954-1958	7½	35	580	584	+286
Dredge No. 3. Built 1923					
1924	—	—	—	283	
1925-1928	—	—	600	284	
1929-1954	12	28	745	590	
1954-1958	13	28	810	675	+138
Dredge No. 4. Built 1932					
1932-1958	8	34	680	418	
1958[3]	9	24	480	249	— 68
Dredge No. 5. Built 1937					
1937-1958	12	27	720	490	
Dredge No. 6. Built 1938					
1938-1948	8	35	620	427	
1948-1954	10½	31.4	730	525	
1954-1958	11	32	780	645	+ 51

1. No records available of yardage between completion in 1915 and 1924.
2. No records available of yardage between completion in 1920 and 1927.
3. Bucket speed reduced to 24 per minute when digging in the river, and increased to 34 per minute when digging in a flat. The reduction in production in 1958 is due to the extremely difficult digging conditions encountered.

TOKYO TIPS



Mining and Milling

by George O. Argall, Jr.

Japan Looks Abroad for More Ore

The hotel building boom is only part of the major construction program underway here in Japan. This new construction includes many factories for making everything from color TV sets to steel rolling mills.

New plants and new products necessitate more metal. That's the reason why the Japanese industry will be playing a more important part in world mining—from Canada to Chile, from India to Brazil—as reported below.

COPPER DEMAND here in Japan has soared in the last two years and mining leaders are unanimous in their opinion that this demand will continue. These interesting figures show what a growing market there is for copper concentrates in Japan. From imported ores and concentrates 36,713 metric tons of electrolytic copper were produced in 1958; 59,941 in 1959, and a record 125,000 is scheduled for the fiscal year ending March 1, 1961.

I was fortunate to have an interview on copper with Mr. S. Yamagata, president, Mitsubishi Metal Mining Company Ltd. Mitsubishi is the largest copper miner in Japan and the second largest producer of electrolytic copper. He said that copper was such a necessary metal for today's civilization that nothing could replace it for important uses, that demand will continue to grow, and the mining companies will deliver all the copper needed. Mr. Yamagata is a metallurgist and gave the engineer's view point when he said, "The mining and metallurgical engineers will meet tomorrow's challenge by better technical methods to recover copper from lower grade deposits. This will vastly increase the supply of copper."

The long discussed electrolytic zinc refinery for Peru appears to be a step nearer. The Peruvian government has asked for a quotation on engineering and construction of a plant similar to that of Mitsubishi at Akita in northern Japan. The Akita refinery was described by Mr. K. Nakanishi in an exclusive MINING WORLD-WORLD MINING article.

IRON AND STEEL PRODUCTION is scheduled to double in the next 10 years here in Japan. Again, some figures to show what an important market Japan is for iron miners, whether they are in Nevada, British Columbia, Chile, or India.

The plan for 1960 calls for importation of 11,726,300 metric tons of iron ore. Of this, 8,496,400 will be sintered. Percentage wise, sinter feed is scheduled to increase in the future to improve structure of charge. Pyrite calcine and copper residue are widely used for iron ore here. At one copper smelter I saw a copper flotation tailing which assayed 53 per cent iron shipped to a steel plant despite its fineness—90 percent minus—325-mesh. So you can see why sintering has long been necessary. There is only one pelletizing plant in operation and the steel company has not released any data on operation.

NATURAL RESOURCE GOALS for Asia and the Far East were defined at a recent Tokyo meeting presided over by H. Kurushima, president of the Dowa Mining Company. A two year program designed to achieve these goals was developed at the conference.

Highest priority was given to prospecting and dissemination of information relating to methods of exploration, mining, and processing.

Aerial surveying in the area will get a big boost as an aerial survey training center will be established somewhere in the region.

IRON ORE IMPORTS: Japan looks to India for increased imports of iron ore starting in 1962. The Japan Consulting Engineer Institute has engaged the Nittetsu Mining Company Ltd. to act as consulting engineer for the development of the Rourkela mine for production of 2,000,000 annual tons of ore. The Indian government will build a 300 kilometer long railroad and loading docks at the port of Vizagapatnam on the southeast coast. Reserves are estimated at 180,000,000 tons assaying 63 to 65 percent iron. A crushing and screening plant will be built, and a small amount of stripping done before shovel-truck mining is started. Nittetsu is now negotiating equipment specifications with the National Mineral Development Corporation which will buy the equipment.

A second mine, the Bailadelia, is under consideration to produce 4,000,000 annual tons after 1966. The Orissa Mining Development Corporation controls this deposit.

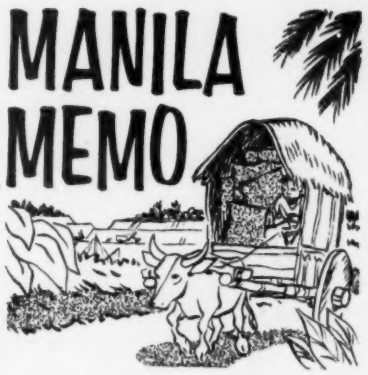
An entirely new iron ore source, laterites, may be opened up if the rumors about Yawata Steel Company's successful treatment of this iron bearing formation are true. The nickel and cobalt content constitute an important added alloying advantage.

There is a strong divergence of opinion about future iron ore supplies. One group favors import of high grade ore from as far away as Venezuela, South Africa, and Brazil. Another group figures that the $6.00 per ton freight differential to Philippine and Malayan ports could better be used for beneficiation and pelletizing plants. Both groups will probably see their plans carried out.

EXPANSION: Overseas expansion is the keynote of Japan's mining and smelting industry today. The theme is best presented as you walk into the Tokyo office of the Mitsui Mining and Smelting Company and you immediately see giant sized ceiling to floor maps of Chile and Peru pasted on the walls. Mitsui has had an engineering staff in Chile since last year surveying the copper industry. Engineers believe that there is a middle ground there for Japanese participation in joint ventures. The large low grade deposits require too much money for the Japanese, the rich high grade mines are already being operated, but the third or middle group mines which often are difficult or expensive to operate now offer opportunities END

in the Far East

Editor of Mining World



Philippine Mining Still Growing

PHILEX MINING COMPANY, the newest major copper producer in this growing copper mining country has just milled its first 1,000,000th ton of copper-gold ore. By special arrangement with Philex General Manager, George T. Scholey, I was at the mine on May 31st when this millionth ton was mined from the 1C-1 block cave stope at the mine south of Baguio, Mountain Province.

Philex is opening a new chapter in Far Eastern mining with this block caving. The company has proved beyond a doubt that block caving is the most economical method for underground mining of the massive disseminated copper ores of the Philippines. Special techniques have been perfected for mining under the most adverse weather conditions. Typhoon Lucille dumped more than 5.0 inches of water into the Philex open pit and block cave area in less than 10 hours. Mining was not interrupted and ore drawing continued at the normal rate.

The new mill at Philex is treating 1,850 tons of ore daily. It has the highest milling rate per manshift of any Philippine mill. Average milling cost per short ton for 1959 was 1.63 Pesos. While the exchange on Peso varies widely the Free Market of 3.80 for $1.00 US in Hong Kong at the moment gives you a conversion factor. Mining World-World Mining will feature the entire Philex operation in an early issue. Watch for the article.

BENGUET CONSOLIDATED, INC., the oldest operating company in the Philippines and a long time premier gold producer will probably expand into copper production too. Take a look at a map of the Philippines. Far southwest, just north of Borneo you will find the small island of Balabaci. The east coast is where Benguet has discovered and proved a massive sulphide ore lens by diamond drilling, More than 500,000 tons of plus-5.0-percent copper has been outlined to date. Ore is almost pure sulphide with chalcopyrite, pyrite, and sphalerite. Intensive metallurgical testing and economic evaluations which are now underway will soon give the answer to starting a new operation. Metallurgy is tough. All methods of treatment are under study; one of the most promising being flotation and sulphurous acid leaching of concentrate.

At the company's Acupan-Antamok gold mines at Baguio the ore reserve position is good. In last two years more ore was developed than was mined despite the greatest monthly tonnages in history—a record 107,000 tons in May. Reserves do not include any tonnage below main 2,000 adit at Acupan where deep diamond drilling has found strong mineralized fissures. The new concrete lined circular Lode shaft is being competed here to centralize hoisting operations and develop the lower levels to 2,900.

Benguet is operator of the world's largest refractory chromite mine at Coti, Zambales. Century Geophysical Corporation is conducting geophysical surveys here to increase ore reserves. Most encouraging sign is the expanding market for stockpiled "fines". A good grade and marketable concentrate, plus-10-mesh in size, is now being made with a heavy media cone. Lump ore production continues in the large HMS mill.

EXPLORATION has been a major project by Benguet for several years with many hundreds of properties examined. Keep your ears open for reports on a promising disseminated copper deposit west of Dolores, Samar, where geophysical prospecting is to be followed by diamond drilling.

LEPANTO CONSOLIDATED MINING COMPANY mining one of the world's truly great ore bodies at Lepanto in the Mountain Province is now operating a unique hand filling system. Mill tailing is thickened with underflow dewatered in filter bottom bins before transportation by aerial tram to the top of the mountain 1,160 feet higher. A repulping plant at discharge terminal prepares 800 tons per day of 63 percent solid fill for distribution to mine stopes through churn drill holes. Several unusual stoping methods including 45° inclined panels with horizontal cuts, and underhand cut and fill stoping are now used at Lepanto—all made possible by sand fill advantages.

Constant metallurgical testing is carried out by the milling department. Major projects are the lowering of the gold in tailing and faster flotation of the luzonite in the ore. Gold recovery is difficult because of its extreme fineness and extensive dissemination in the mineralized zones. Luzonite, mineralogically similar to enargite, but with a higher tin content, is much slower and more difficult to float than the enargite.

BENGUET EXPLORATION is a classic example of what high grade ore can accomplish. By clean mining and careful sorting a 1-ounce gold head is maintained from the Thanksgiving mine at Baguio. Philex Mining Company is the operator and is far more interested in profits than tonnage. The ore has a high copper and zinc content which discouraged earlier operators because of extremely large cyanide consumption. Philex's consulting metallurgist, Albert Pessin, fortunately found that stage agitation leaching with solution bleed off was the way to cut cyanide consumption in half to make milling economically feasible.

The Islands newest "old" gold producer is the Suyoc mine of Itogen-Suyoc Mines, Inc. in the Mountain Province.

All mining at Suyoc is by square sets. Here are some figures for comparative purposes. The mine is relatively small; it is remotely located, and supplies and repair parts are most difficult to obtain. Tons stoped per manshift, 2.12; feet development per manshift, 0.50; tons ore blocked per development foot, 3.46; board feet timber per ton mined, 27.6; dynamite pounds per ton, 0.89; and kilowatt hour consumption (mine mill etc.) per ton, 49.2. *END*

EUCLID'S GREATER DIMENSION

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Model R-27 has rated payload of 54,000 lbs. and a heaped capacity of 26½ yds. . . . available with Cummins 335 h.p. and GM 336 h.p. engine . . . 4-speed Torqmatic Drive with converter lock-up and Torqmatic Brake . . . dual hydraulic booster steering . . . 18.00 x 25 tires on all wheels . . . rugged body with twin hoists . . . top speed with full payload, 34 mph.

Backed by better than 25 years of specialized experience in building off-highway earthmoving equipment exclusively, Euclid's modern rear-dump line incorporates advanced engineering that is a result of unmatched field experience. From the 10-ton Model R-10 to the big 55-ton "Euc" with two engines and a total of 672 h.p., Euclid Rear-Dumps meet today's requirements for big performance.

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Euclid (Great Britain) Ltd., Lanarkshire, Scotland

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GM GENERAL MOTORS EUCLID

EUCLID EQUIPMENT

FOR MOVING EARTH, ROCK, COAL AND ORE

PRODUCTION EQUIPMENT PREVIEW

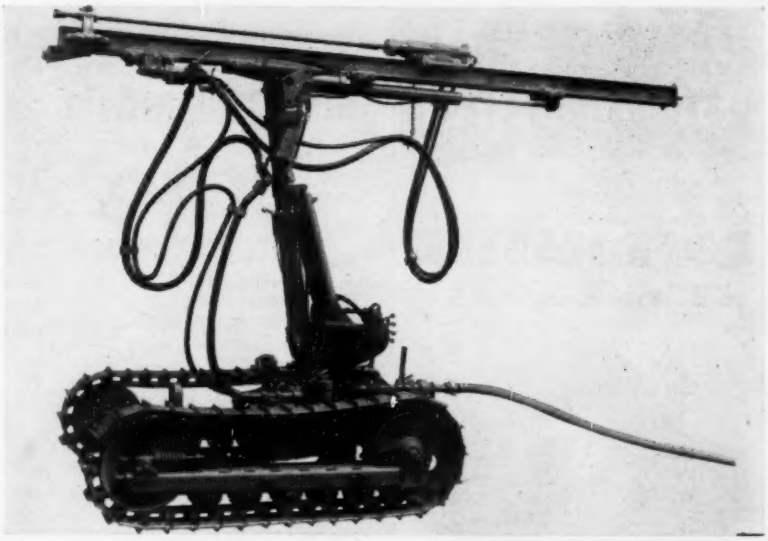
For data on any item on next three pages use the inquiry card opposite page 48

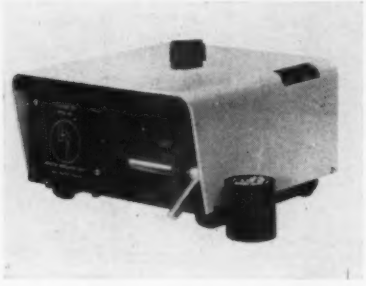
Versatile New Tracdril Covers 180 Degree Arc, 17 Feet In Diameter

A versatile new Tracdril that covers a 180 degree arc, 17 feet in diameter, has just been announced by the Chicago Pneumatic Tool Company.

Capable of drilling horizontal snake-holes a scant 25 inches from the ground, the boom of the G-900 Tracdril can be raised to a height of 11 feet for horizontal breast-holes. The carriage dump adjusts through a full 360 degrees, increasing top-hole reach. The 85-degree carriage swing allows vertical holes to be drilled regardless of slope conditions.

A 12 hp tramming team, powerful enough to tow a 600 cfm compressor up a tough 20 percent grade, provides the driving force for the G-900. Specially constructed Oliver crawlers furnish 1,350 square inches of ground-hugging contact. Five tower track wheels and 10-inch wide tracks maximize stability. Release the tramming throttle and the "dead man" controls snap back to neutral while automatic brakes instantly lock the tracks positively in place. Circle No. 88.





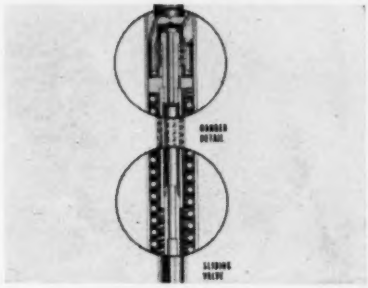
Specific Gravity In One Minute

An entirely new principle for rapid non-destructive volume, density and porosity measurement on irregular, powdered and porous solids is incorporated in the Air Comparison Pycnometer. It is a valuable laboratory and field instrument for saving time on measurements formerly done with displaced liquids or involving direct pressure determination. Of greater importance are the new areas of application for density measurements now made practical in identification, analysis, and evaluation of irregular or porous solids of varying degrees of compressibility.

The Air Comparison Pycnometer requires no liquids, no gas pressure determination and no temperature control. A complete measurement may be made by an unskilled operator in one minute. Circle No. 69.

Portable Screening Plant

A new and improved portable conveyor-screening plant has been announced by Lippmann Engineering Works, Inc., Milwaukee, Wisconsin. Combining reciprocating feeder, conveyor, and vibrating screen, the entire unit can be transported from one location to another without dismantling. A noteworthy feature is the fact that both engine and drive are located at ground level. This is said to offer three advantages over customary head-end drive. (1) Increased concentration of weight at tail-end of conveyor improves balance and stability, and gives unobstructed loading area under screen; (2) ground level location of engine saves time and effort for start-stop, throttle control, refueling, and maintenance; and (3) extended drive linkages to head-end pulley are eliminated. Circle No. 83.



Sampler Offers High Accuracy

New Pitcher Sampler from Mobile Drilling, Incorporated is designed specifically to recover accurate samples from problem clays, soft rock and friable shales. New design and operating features provide distinct advantages over present core barrel type samplers. Drilling fluid cannot erode or contaminate sample even in soft overburden or water-sensitive formations. Unit features spring-seated shelby tube which telescopes into outer barrel as cutters core harder formations to eliminate excessive pressures and prevent tube damage. Equally important, the Pitcher Sampler requires no presetting or surface control. The drill can be stopped, rod rechucked and even raised slightly without breaking core. No separate reaming operations are needed to obtain deeper samples. Circle No. 74.

27
TYPES AND SIZES
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SLUSHER BLOCKS

No. 508 — One of a new series designed for big slushers that utilize shaft ropes. Built to withstand the extreme abuse of such service.

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Portland 14, Oregon

Repair Your Damaged Conveyor Belts

There's a new answer to the old problem of damaged conveyor belting—an answer which can save an operator both time and money.

No longer does damage caused by a piece of tramp metal, a sharp rock or a tight skirtboard, mean that a conveyor belt must be consigned to the scrap pile.

A new, continuous, belt repair process, developed in Northern Minnesota and now serving industrial operations throughout the nation, successfully restores damaged conveyor belts to full life expectancy.

Conveyor Belt Service, Inc., headed by W. A. Mars of Duluth, Minnesota, is in the business of repairing belts—all types of rubber belts. With plants located in Virginia, Minn., and Cleveland, Ohio, Conveyor Belt Service, Inc., has repaired upwards of 50 miles of damaged and worn conveyor belting, since late 1953 when the Virginia plant first went into operation.

The continuous belt repair process was conceived by W. A. Mars, a Duluth industrial supply distributor, as he served various mining operations in the Lake Superior District. Mars became concerned about the high losses which resulted when a conveyor belt was ripped, worn or damaged in some other way.

For five years, he, together with his brother, R. S. Mars, Jr., now a vice-president of CBS, Inc., experimented with different methods and equipment, searching for a successful repair process that would be continuous. At the time, spot repair work was fairly common, but a long tear or rip, or extensive wear, usually meant that the belt would be scrapped.

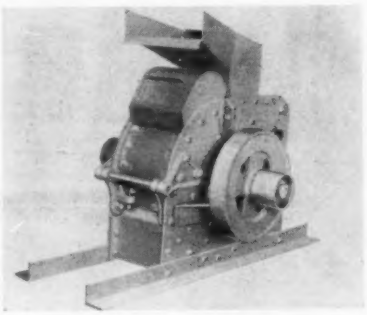
Mars developed a specially designed vulcanizing platen press which could handle long lengths of belt efficiently. He also worked up a suitable drying method which helped to prevent belt blow-ups, due to moisture in the belt interior.

The first belt received by CBS, Inc., in late 1953, came from a Mesabi Range iron mine. The cost of replacing the belt would have amounted to $15,000. Instead, the belt was repaired by CBS, Inc. for $6,000. The same belt, today, after moving some 8,000,000 tons of material is still in good operating condition.

Following this first successful job, the operators of CBS, Inc. began to handle almost every type of belt, and repair every conceivable type of damage. A tear 2,200 feet long in one belt was repaired in 18 days. A 400 foot rip in a steel cable, reinforced 60" belt was completely repaired, and a 1,600 foot belt from a limestone quarry in Iowa was back in service less than three weeks after CBS, Inc. received it. Recently, a belt 106 inches wide was repaired.

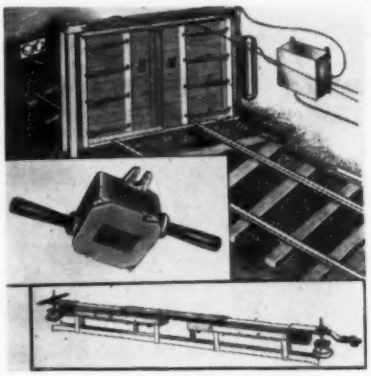
Originally designed to serve mining operations in the Lake Superior District, CBS, Inc. has extended its service to various industries throughout the nation, and to foreign countries as well. Thus it was announced late last year that a second plant would be built in Cleveland, Ohio.

While CBS, Inc. has grown, the company recognizes that conveyor belt repair is still somewhat of an innovation, but feel that industry will turn to the practice much more in the future. For information circle No. 77.



New Hammer Crusher

An all purpose pulverizer for industrial and aggregate crushing installations has been announced by Iowa Manufacturing Company. This efficient Cedarapids Model 20 pulverizer and crushing unit combines top tonnage production with low initial cost and low operating cost. The result is secondary pulverizing and crushing—from dust to two-inch material and especially for use as a pulverizer for burnt lime, gypsum, limestone, oyster shell, salt, chalk, and most hard, dry, non-oily, non-fibrous materials. It is also ideal as a sampling crusher. Circle No. 71.



Air Power Mine Doors

For safe, efficient ventilation control underground "Canton" air power mine doors offer trouble-free service since all working parts are overhead.

"Canton" doors, manufactured by the American Mine Door Company of Canton, Ohio, offer several outstanding features: (1) They "give" in cases of explosions but return to normal closed position after pressure passes; (2) they remain closed when air currents are reversed; (3) there is no hazard of one-way opening since the door wings swing opposite directions; (4) they are easily movable; and (5) they have no trick latches but automatically open and close quickly and efficiently. Circle No. 90.

MORE NEW EQUIPMENT . . . AND NEW LITERATURE

SPIRALWELD PIPE and Wedgelock couplings that are light in weight and easy to install are the subject of Bulletin No. 59 issued by the Naylor Pipe Company of Chicago. Circle No. 1.

PUMPS: To have an easy key to the correct type and size of pump for handling abrasives, corrosives and acids, "Technical Data" Brochure No. 357 has just been issued by the Allen-Sherman-Hoff Pump Company. Circle No. 2.

REPLACEMENT PARTS of manganese steel are the subject of the new illustrated Columbia Bulletin No. 1063 which features crusher, tractor, shovel, and bucket replacement parts. Circle No. 3.

SURVEYOR'S LEVEL that is tough, rugged and compact as well as ingenious for ease of operation is described in Booklet N-10 issued by Wild Heerbrugg Instruments, Inc. Circle No. 4.

INDUSTRIAL DIAMONDS and their uses are described in an interesting free brochure just released by the Diamond Tool Research Company, Inc. of New York. Circle No. 7.

CORE DRILL that is portable, lightweight, easy to set up and operate is the Packsack model made by the Acker Drill Company. This efficient compressed air powered drill is detailed in their Bulletin 22-MW which is sent to you free by circling No. 8.

VENTILATION TUBING that is tough, durable, easy to install and remove, lightweight, made of long-lasting materials is described in Catalog 59 just released by the American Brattice Cloth Corporation. Circle No. 9.

ROTARY BLAST HOLE DRILLS are described in Bulletin 341-8 by the Joy Manufacturing Company. Four models in the Champion line are available with capacities from 5⅝ to 12¼ inches hole size. Circle No. 10.

RELIEF VALVE: The new "Hydrelief" valve is announced as a major advance in pilot operated relief valves by the Parker-Hannifin Corp. It is said to be suitable for use in hydraulic systems that must operate in remote places where regular maintenance routine is difficult. Circle No. 39.

QUICK-COUPLING, STEEL PIPE that is lightweight and galvanized proves time and labor saving for supplying compressed air to mine face according to McDowell Manufacturing Company of Pittsburgh. Circle No. 24.

CYANAMID FLOCCULANTS are the subject of technical notes prepared by American Cyanamid Company. This comprehensive booklet should be added to the files of metallurgists. Circle No. 31.

CENTRIFUGAL AND TURBINE PUMPS are described in a new four-page condensed bulletin by Aurora Pump Division of The New York Air Brake Company. Single and multiple stage, flexible and close coupled, horizontal and vertical are featured with typical applications, capacities and head ranges. Circle No. 32.

POWER STEERING components that can be combined to suit virtually any steering axle load requirement are described in a new brochure, M-5110, recently released by Vickers Incorporated. Circle No. 33.

SANITIZER AND DEODORANT for mine change rooms, bathrooms, and vehicles, as well as boots, clothes, safety products, and other equipment has been announced by E. D. Bullard Co. The new "Two-Way" germicide is packaged in 12-oz. aerosol containers. Circle No. 37.

PLASTIC PIPE that solves acid water corrosion problems is described in a new technical handbook just released by Kraloy Plastic Pipe Company. This free 36-page book gives complete specifications and details of this versatile pipe. Circle No. 50.

SPEED REDUCERS are the subject of a new 64-page bulletin released by the Dodge Manufacturing Corp. Modern methods of speed reduction with compact, shaft mounted units in a wide range of sizes and horsepowers are described. Circle No. 51.

PRODUCTION ROAD is the title of the magazine published by the Twin Disc Clutch Company. This quarterly publication contains several interesting feature stories in each issue and is available by circling No. 52.

MOTORIZED PULLEYS are described in a new catalog just published by the Western Conveyor Company. The catalog gives specifications and dimensions for the latest models of standard Schrock Motorized Pulleys from 1 to 75 HP and with face widths from 22 to 57 inches. Circle No. 53.

TORQUE WRENCH that provides exact stress needed for safe mine supports has been announced by Apco Mossberg Company. The 2DF-300 Torque Wrench is ideal for applying precise torque to fastener bolts on mine support timbers, and maintaining proper tension on interconnecting cables. Circle No. 54.

TRAMP IRON REMOVAL from slag can now be done with greatly increased efficiency according to the Magnetic Engineering & Manufacturing Co. Their SE series magnet, mounted an amazing 15

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46	47	48	49	50	51	52	53	54	55	56	57	58	59	60

61	62	63	64	65	66	67	68	69	70
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inches above the belt, has an exclusive space winding feature and oil cooling of the coil, which assures higher operating wattage. Circle No. 55.

FREE 28-PAGE handbook titled "Judging Engine Quality" should be required reading for everyone involved with the purchase of an industrial engine. This informative booklet has just been published by Caterpillar Tractor Company. Circle No. 58.

HARD HATS that are light, compact, and stress maximum protection and long-wearing comfort are the latest safety product from Bausch & Lomb. Circle No. 59.

CORE BARRELS of a new design introduced by the E. J. Longyear Company recover cores up to 25 percent larger in diameter than their original Wire Line barrels. Less carat weight of diamond plus increased penetration speed and bit life are features of these new core barrels. Circle No. 28.

EXHAUST FAN available in all capacities for horizontal or vertical installations that is extremely silent running, with easily replaceable component parts is offered by Turnag of West Germany. Circle No. 29.

PUMP that uses a unique, positive displacement pumping action to literally squeeze water upward, is the subject of a bulletin issued by Peerless Pump of Food Machinery & Chemical Corp. Named the "Hi-Lift", this pump employs a corkscrew-like rotor which rotates within a contoured stator. The action of the rotor creates a positive displacement action, moving a constant flow of water to the surface. Circle No. 25.

CONCENTRATING TABLE: The Super-Duty Diagonal-Deck table manufactured by the Deister Concentrator Company is the subject of their Bulletin No. 118C. Low cost and high mineral concentrating efficiency are the features of this table. Circle No. 26.

CONVEYOR SUPPORT that uses pre-stressed concrete channels is a recent development announced by the Frank J. Madison Company of San Francisco. A unique design uses inverted U-shaped beams to protect the conveyor system while offering lower initial cost and maintenance. Circle No. 27.

PORTABLE ELECTRIC BLOWER that blows air at either room temperature or at 170 degrees F. has been introduced by Ace-Sycamore, Incorporated. Air stream velocity is 11,500 feet per minute of either hot or cold air. Circle No. 35.

VENTILATION TUBING for mines and tunnels is described in a concisely-written 12-page booklet by Bemis Bro. Bag Company. Included in the booklet are diagrammatic illustrations, tables, drawings, and photographs of Flexipipe installations. Circle No. 36.

FREE 16-PAGE BROCHURE which includes a vast amount of information and technical data on bearings, bushings, bar stock and babbitt metal has just been produced by The American Crucible Products Company. Circle No. 38.

FLUID COUPLINGS are covered in Bulletin 144-E, newly issued Twin Disc Clutch Company. The illustrated bulletin gives details on basic couplings for many uses with a wide variety of input-output combinations for consumer use. Circle No. 40.

MOTO-LOADER: A new 16-page, two-color bulletin, has just ben released covering the Lorain Model ML-157 with 7000 lb. carry capacity. Booklet explains machine's exceptional balance of weight, power and control, and other details. Circle No. 41.

WIRE ROPE SLINGS, said to be the strongest in the world, offering greater safety and strength than heretofore, have been announced by the Wire Rope Sling Department, American Chain & Cable Company, Incorporated. Circle No. 42.

GEOPHYSICAL services offered by the Heinrichs Geoexploration Company of Tucson, Arizona, experts in the search for and development of natural resources, are described in a new, illustrated, eight-page brochure recently issued by the company. Circle No. 43.

NEW CONVEYOR BELT with diagonal ridges on its top has been developed by Hewitt-Robins Incorporated to carry wet sand, gravel and other materials up steep slopes. Information on the new "Cleat Top Belt" may be obtained by circling No. 44.

QUARTZ CRYSTAL TRANSDUCERS: A new, highly illustrated brochure just published by Kistler Instrument Corporation, shows a full line of Kistler natural quartz crystal transducers for pressure, force, acceleration and vibration measurements. Circle No. 45.

GRINDING RODS, their use and manufacture, are described in an illustrated 14-page booklet recently released by The Colorado Fuel and Iron Corporation. For a free copy circle No. 47.

REAR DUMP MOTOR WAGON is the newest addition to the Allis-Chalmers construction machinery line. The new, all hydraulic TR-160 has a carrying capacity of 12 tons. Circle No. 48.

DUST COLLECTORS are the subject of a new six-page illustrated bulletin now available from American-Standard Industrial. Operating characteristics, design and construction principles are discussed. Circle No. 49.

STEEL HEAD MILLS are described in the new illustrated Bulletin No. B2-B20 just released by Denver Equipment Company. Both ball mills and rod mills are featured with specifications and details. Circle No. 12.

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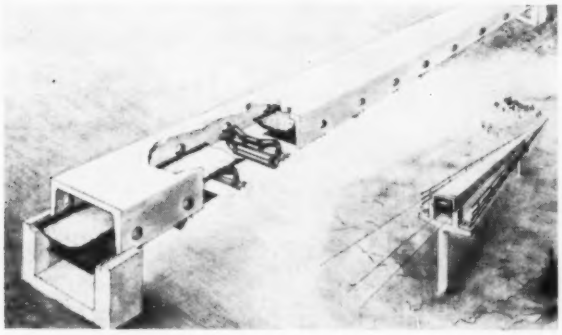
Slag Transporter Offers Savings

In their special vehicle program the Faun-Werke of West Germany have developed a new Slag Transporter in order to help lower internal transport costs in the steel industry. This versatile machine was specially designed for the transport of liquid slags and features a low center of gravity, 8-cylinder 170 hp Deutz Diesel engine for front-wheel drive, and two special wheel axles with 16 solid rubber tires.

The all steel driver's cabin is furnished with double operating panels for forward and reverse drives. The glassed back wall has flaps of aluminum plate for radiation and heat protection.

The special loading platform takes the 14 ton slag bucket which will carry 22 tons of liquid slag on a motor-hydraulic tipping device. Depending on operation requirements it is possible to use different type buckets on the one vehicle. Hydraulic cantilever arms to pick-up, tilt, and lower the slag bucket are controlled from the driver's cabin. Circle No. 30.



Prestressed Concrete For Conveyors

The Frank J. Madison Company of San Francisco has announced development of a materials handling system that uses prestressed concrete channels as the conveyor support. In this unique dseign the U-shaped beams are inverted so as to also serve as a protective cover for the belt, drive, idlers and the material being handled.

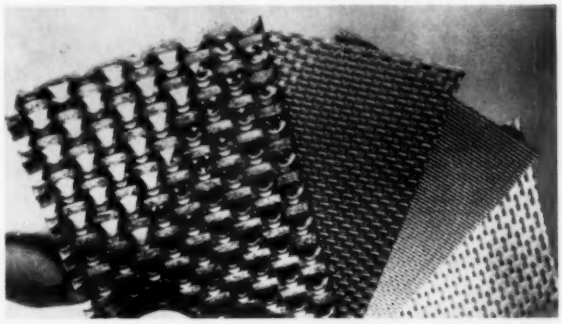
Lower initial cost is cited as the chief advantage of the prestressed construction. Inserts for idler attachment are integrally cast in the channels, eliminating the need for steel hangers. Supporting piers and changeovers may be pre-cast or cast-in-place and no steel structurals are required. Comparative studies indicate savings of 40 percent over conventional steel construction. Maintenance costs are also lowered due to concrete's inherent freedom from weathering. Circle No. 91.

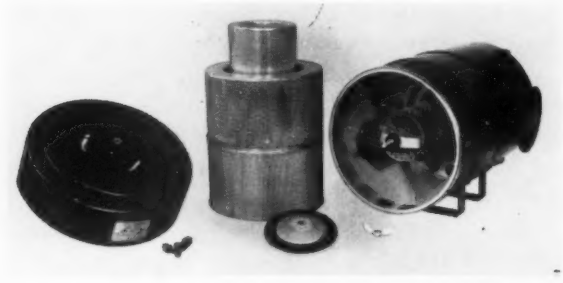
New Material Said to Triple Screen Life

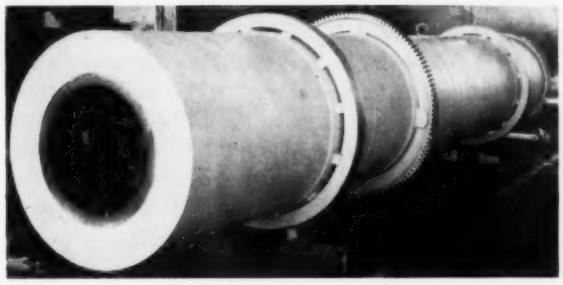
A new pierced metal sheet known as Conidure can offer substantially higher throughput efficiencies reports National-Standard Company.

The working side of Conidure, which has the smaller end of tapered holes, has humps that act in shovel-like fashion to guide material to the openings. The long life and freedom from clogging claimed for Conidure results from this shovel-like action and from the steep breakaway of the hole sides from the working side of the sheet. The sheet-thickness-to-hole-diameter ratios of up to 7 to 1 is also reported to be an important factor in providing long wearing life and non-clogging features.

Conidure pierced metal is available in sheets up to 31 inches wide or formed into various shapes. Circle No. 6.







Filters Provide Positive Protection

New two-stage air filters—two filter elements in a single housing, with each element independently sealed—for both heavy duty automotive and industrial engines have been announced by Purolator Products, Inc. Both the first and second stage elements of the new two-stage filter operate independently at 99.8 percent efficiency at all engine speeds. Circle No. 73.

Chain Internals Prevent Clogging

Standard Steel Corporation designed special chain internals for this 4-foot diameter by 30-foot rotary kiln for the calcining of yellow cake. These chain internals, installed at the feed end, prevent uranium oxide slurry from clogging the kiln. The kiln, shown here in the Los Angeles plant of Standard Steel, is now in operation at Grants, New Mexico. Circle No. 72.

14 CAT DW20 RIGS HELP SPEED PRODUCTION IN THE LUCKY Mc URANIUM MINE!

Located in isolated Gas Hills, Wyoming, the Lucky Mc Uranium Mine is classified as a medium-large open pit installation. Ore deposits occur from surface to depths of 500 feet. Overburden is composed mainly of loose sands and sandy shales. The stripping contractor, Utah Development & Mining Co., operates a fleet of 18 tractor-scrapers to haul this material. Mainstays of the fleet are 14 four-wheeled Cat DW20 rigs. Working 20 hours a day, 6 days a week, the fleet averages 30,000 yards a day on hauls of ¼ to ½ mile with maximum 6% grade. Two Cat No. 12 Motor Graders maintain the haul roads to keep the scrapers rolling.

Just as at Lucky Mc, the DW20 Series G Tractor and No. 456 Scraper is ready to deliver faster cycles and bigger loads on your job. Here's why: it packs 345 HP (max. output) and 12% higher rimpull compared to the former model. This increased rimpull provides up to 20% faster travel speeds under similar conditions. The new No. 456 Series B LOWBOWL Scraper has 8% greater capacity—19.5 cu. yd. struck; 27 cu. yd. heaped. There's also a new No. 482 Scraper, with a capacity of 24 cu. yd. struck; 34 cu. yd. heaped.

New optional SynchroTouch Transmission Control

Now optional for the DW20, the SynchroTouch Transmission Control is an advanced new way to shift gears faster and easier. The operator simply dials desired gear for automatic, split-second, touch-and-go response. Result: faster cycles and more payloads per hour.

With all its improvements, the new DW20-No. 456 meets your needs for moving more dirt at lower cost. See this high-capacity hauler at your Caterpillar Dealer. Ask him to demonstrate. Pick a tough job—watch it handle the hard work!

Caterpillar Tractor Co., General Offices, Peoria, Illinois, U. S. A.

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The Turbulaire-Doyle Scrubber is unique in its high collection efficiencies and low maintenance requirements because it incorporates a jet-action design that assures a far more thorough scrubbing action—yet requires no complex mechanical systems that boost maintenance and repair costs.

THE JET-CONE MAKES THE DIFFERENCE!

This Jet-Cone in the throat of each Turbulaire-Doyle inlet tube causes a sharp increase in the velocity of the incoming gases—the velocity reaching maximum at the point where the dirt-laden gases impinge upon the scrubbing liquid.

RESULT: ***unusually deep penetration of gases into the scrubbing fluid for more complete cleansing of all suspended particles—even those in the fume range.***

Yet there are no moving parts—nothing to require frequent repair or replacement!

ILLUSTRATED ABOVE: Two-stage rubber-covered units remove dust and fume from gases at wet process phosphoric acid plant. Capacity: 64,000 CFM.

Compare
TURBULAIRE-DOYLE ADVANTAGES

- **HIGH COLLECTION EFFICIENCIES** generally in the 97% to 99% range.
- **FINE PARTICLE COLLECTION** even fume-range particles.
- **LOW LIQUID-TO-GAS RATIO** only 1 to 5 GPM/1000 CFM.
- **NEGLIGIBLE MAINTENANCE** no moving parts to wear or corrode—no "plugging" problems.
- **NO CORROSION PROBLEMS** simple design permits wide choice of corrosion-resisting materials.

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Metal & Mineral Prices

U.S.A.

METALS

June 17, 1960

COPPER: **Electrolytic.** Delivered F.o.b. cars, Valley basis (pound) ..... 33.00¢
Lake. Delivered, destinations, USA ..... 33.00¢
Foreign. Delivered, destinations, USA ..... 33.00¢
Custom. ..... 33.00¢
LEAD: **Common Grade.** New York (Per pound) ..... 12.00¢
Tri-State Concentrate, 80% lead, per ton $141.72
ZINC: **Prime Western:** F.o.b. E. St. Louis (Per pound) ..... 13.00¢
Prime Western: Delivered New York ..... 13.50¢
Tri-State Concentrate, 60% zinc per ton $80.00
ALUMINUM: **Primary 30 Pound Ingots (99.5% plus)** (Per pound) 28.10¢
ANTIMONY: **Lone Star Brand. F.o.b. Laredo, in bulk** (Per pound) 29.50¢
BISMUTH: (In ton lots) price per pound $2.25
CADMIUM: **Sticks and bars.** 1 to 5 ton lots Price per pound .. $1.50
COBALT: **97-99%,** keg of 500 pounds (Price per pound) $1.50
COLUMBIUM: **Ingot** ..... Nom., per pound $55.00-$85.00
GERMANIUM: dioxide, high purity, gram ..... 18.50¢
LITHIUM: **98%** (per pound) ..... $9.00-$12.00
MAGNESIUM: **Ingots (99.8%)** F.o.b. Velasco, Texas per pound 36.00¢
MERCURY: **Flasks.** Small lots, New York ..... $213.00-$215.00
NICKEL: **"F" Ingots (5 pounds).** F.o.b. Port Colbourne, Ontario 75.50¢
PLUTONIUM: To July 1 1962 AEC will pay $30.00 to $40.00 per gram depending on plutonium 240 content. July 1, 1962 to June 30, 1963, per gram $30.00
SELENIUM: **99.5% per pound** $7.00
TELLURIUM: Common grade, Per pound $3.50
THORIUM: per kilogram $43.00
TIN: **Grade A Brands.** New York (Per pound) Prompt delivery 101.12½¢
TITANIUM: **99.3%** + Grade A-1 Sponge (Per pound) ... $1.50-$1.60
URANIUM: **Rod** (0.790 U-235) $16.00 Per Pound; Foil 16.75
U-235: **Nominal** (Per pound) $7.725
GOLD: **United States Treasury Price** ..... $35.00 per ounce
SILVER: **Newly mined domestic.** U.S. Treasury price per ounce 90.5¢
Foreign Handy Harmon ..... 91⅜¢
PLATINUM: Per ounce ..... $82.00-$85.00
ZIRCONIUM: **Sponge,** Per pound, Reactor Grade $5.00

ORES AND CONCENTRATES

BERYLLIUM ORE: **10 to 12% BeO.** F.o.b. mine, Colorado $46.00 per unit Small lot purchases at Custer, S. D., Spruce Pine, N. C., and Franklin, N. H. Visual inspection at $400.00 per short ton or by assaying at 8.0 to 8.9% BeO, $40 per unit; 9.0 to 9.9%, $45; over 10.0%, $48.00.
CHROME ORE: F.o.b. railroad cars eastern seaports. Dry long tons.
African (Rhodesian). 48% Cr_2O_3. 3 to 1 Ratio ..... $35.00-$36.00
African (Transvaal). 48% Cr_2O_3. No ratio ..... $26.00-$28.00
Turkish, 48% Cr_2O_3. 3 to 1 chrome-iron ratio Nominal $36.00-$37.00
U.S. Government ore-purchase depot Grants Pass Oregon. Buying suspended, quota filled.
COLUMBIUM-TANTALUM ORE: Per Pound Pentoxide Nominal $1.10
IRON ORE: **Lake Superior. Per gross ton Lower Lake Ports**
Mesabi, Non Bessemer, 51.5% Fe $11.45
Mesabi, Bessemer, 51.5% Fe $11.60
Old Range Non Bessemer $11.70
Old Range Bessemer $11.85
Lump: Plus ½-inch $12.85
Fines: Minus ½-inch $10.72
Swedish, Atlantic Ports, 60 to 68% Fe Contracts, Per Unit ..... $24.00-$25.00
MANGANESE ORE: **Metallurgical grade.** 48 to 50% Mn Long ton unit ..... $0.95-$1.00
Metallurgical grade. 46 to 48% Mn. Long ton unit .... $0.90-$0.95
Metallurgical grade. 44 to 45% Mn. Long ton unit .... $0.85-$0.90
Domestic U.S. Government. GSA Basis $2.30 per unit for 48% Mn.
MOLYBDENITE CONCENTRATE: **90% MoS_2 F.o.b.** Climax, Colorado. Per pound Mo, plus container cost $1.25
TUNGSTEN CONCENTRATE: **Domestic.** 60% WO_3 Per short ton unit ..... Nominal $24.00
Foreign: 65% WO_3 Per short ton unit (Scheelite) .. Nominal $19.50
Foreign: South American, Spanish, Portuguese .... Nominal $19.50
URANIUM ORE. F.o.b. purchase depot or company mill in accordance with AEC schedules and company buying contracts. Basic price is $1.50 per pound of U_3O_8 in ore assaying 0.10 percent. For each additional 0.01 add 20¢. Subject to development allowance, premiums, penalties where applicable.

NON-METALLIC MINERALS

BARITE: Oil well drilling. Minimum **4.25 specific gravity,** per short ton $16.00
BENTONITE: **Minus-200mesh.** F.o.b. Wyoming. Per ton, carload lots $12.50
Oil Well grade. Packed in 100 pound paper bags $14.00
BORON: technical grade .. F.o.b. Boron California. Per ton .. $47.50
FLUORSPAR: **Metallurgical grade.** 72.5% effective CaF_2 content per short ton F.o.b. Illinois-Kentucky mines ..... $37.00-$41.00
Mexican. 70% F.o.b. border ..... $26.00-$27.00
Acid Grade. 97% CaF_2 Bulk, F.o.b. mine ..... $45.00-$49.00
PERLITE: **Crude:** F.o.b. mine per short ton ..... $3.00 to $5.00
Plaster grades. Crushed and sized. F.o.b. plants .... $7.00 to $9.00
SULPHUR: Long ton, F.o.b. Hoskins Mound, Texas .... $22.50-$23.50

London

June 17, 1960

		Per Long Ton	USA Equivalent	cents per pound*
COPPER:	Electrolytic spot	£247	0s 0d	30.88¢
LEAD:	Refined, 99%	£ 74	10s 0d	9.31¢
ZINC:	Virgin 98%	£ 91	2s 6d	11.27¢
ALUMINUM:	Ingot, 99.5%	£186	0s 0d	23.25¢
ANTIMONY:	Regulus, 99.6%	£197	10s 0d	24.69¢
TIN:	Standard, 99.75% ...	£788	10s 0d	98.56¢
TUNGSTEN:	Long ton unit	160s		$22.54¢

*With Sterling Pound at $ 2.80

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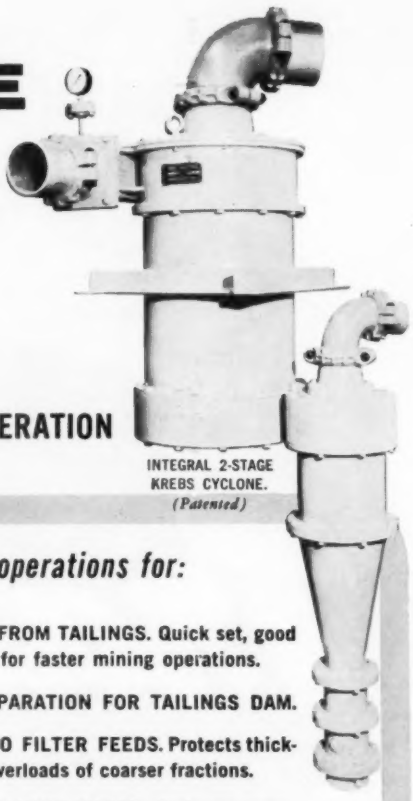

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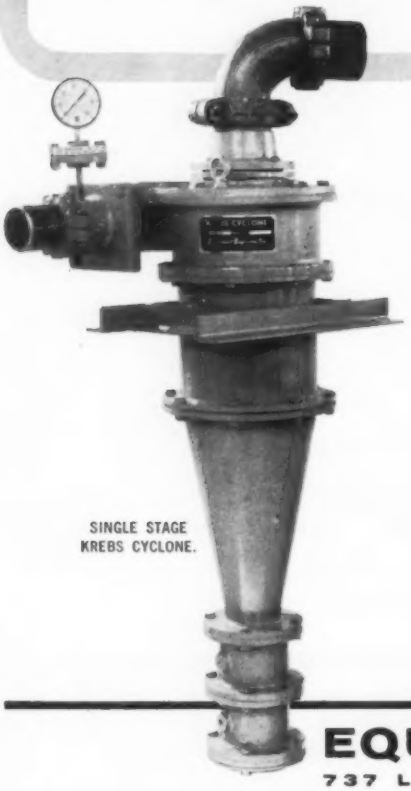
- DESANDING MINE WATER. Reduces pumping maintenance substantially.
- OTHER SPECIAL APPLICATIONS.



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WHAT'S GOING ON in mining

Establishment of heavy media processing plants in the area has made possible the reopening of 10 small mines in Howell County, Missouri. Among producing mines is the **Kingsbury,** owned by **Shook and Fletcher,** located south of West Plains, which is the largest brown iron ore mine in this state. Shook and Fletcher have their own heavy media processing plant, and another one will be opened soon at Koshkonong by the **Schroeder Mining Company.** Two other heavy media processing plants are also scheduled to be located in the area.

An increase in the lead capacity of its Herculaneum, Missouri smelter from 100,000 tons to 150,000 tons is planned by **St. Joseph Lead Company.** Expansion is due to be completed by the latter part of 1962. At the annual meeting of the company recently, a rise in lead consumption by at least five percent and zinc use by 10 percent was predicted by Charles R. Ince, vice president. Operation of the company's new lead mine at Viburnum, Missouri will start shortly.

Columbia National Corporation will resume production of zirconium sponge at its Santa Rosa, Florida, plant, closed early this year when the government questioned the quality of the sponge produced there. The sponge is raw material for zirconium metals used in nuclear reactors and certain special alloys. The company made its first shipment of sponge to the Atomic Energy Commission in 1958 under a five-year, $22,750,000 contract to supply 3,500,000 pounds. The question of quality has been satisfactorily resolved.

R. S. Reynolds, Jr., president of **Reynolds Metals Company** of Richmond, Virginia, said market developments indicate a greater demand for aluminum in 1960. He sees no increase in prices; however, he added, the improving relationship between capacity and demand should promote a more realistic spread between costs and prices.

Texas Gulf Sulphur Company is engaged in a program to appraise the efficiency of a process for extracting lithium from ore by use of sulphuric acid. The company last year optioned from **Basic Atomics, Inc.** exclusive rights to the process and to certain lithium-bearing properties in North Carolina. Texas Gulf operates four Frasch mines in Texas and sulphur recovery plants in Worland, Wyoming and Okotoks, Canada.

Appalachian Sulphides Ltd. at its **Ore Knob** copper mine in North Carolina produced 2,421,084 pounds of copper, 288 ounces of gold and 4,559 ounces of silver during this year's first quarter. Average recovered grade amounted to 1.68 percent copper. There is about 500,000 tons of ore remaining at the mine, and although price of copper and average grade mined will determine life of the mine, indications are for operation for 18 to 20 months under present conditions. Shareholders at the annual meeting were told the company holds out no hope for establishing additional ore reserves. Appalachian is a subsidiary of **Nipissing Mines Company Ltd.**

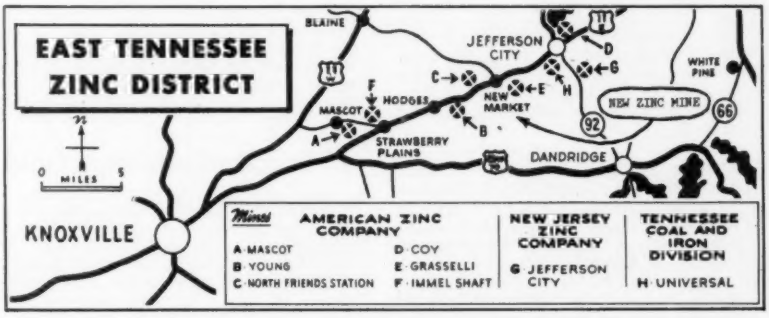
Start of operations at the Humboldt concentrator of **Cleveland-Cliffs Iron Company** near Champion, Michigan, was scheduled for June with pelletizing facilities to be put in use in July. Expansion at the mill includes doubling its capacity, plus the pelletizing facilities at the mine site. **Western-Knapp Engineering Company** of San Francisco, California is constructing the concentrator while **A. W. McKee Company** is completing construction of pelletizing facilities. Kenneth Olson is superintendent of the operation and R. W. Berkhahn is operating metallurgist.

Construction of the Sherman concentrator facilities for **Oliver Iron Mining Division** of **United States Steel Corporation** is progressing near Chisholm, Minnesota. Addition of washing, heavy media, heavy media cyclone and spiral sections is included. Operation is scheduled for spring, 1961. W. Beebe is superintendent of operations.

Ground was broken recently by **National Steel Corporation** for a 4,200,000-annual-ton-capacity sheet and tin plate plant in Portage, Indiana. The plant, which will be the company's Midwest Steel Division, is being built on a 75-acre site bordering Lake Michigan in northwest Indiana. Several mining properties in the Michigan and Minnesota districts are operated by **M. A. Hanna Company** for National Steel.

Pickands Mather & Company is engaged in experimental mining operations at its **Albany** mine which was closed in May, 1958 because of high production costs. After initial rehabilitation work, experimental mining tests were begun. Success of the project depends on whether the cost of mining the single level ore body at the Albany can be lowered by use of three pieces of specialized equipment—a jumbo drill rig; a timbering machine, which is the first of its kind in iron ore mining; and a shuttle car to move ore from the working face to the conveyor which transports it from the mine.

The **Hanna Mining Company** shipped the initial load of iron ore from the Pierce mine, Hibbing, Minnesota. This shipment culminates the completion of stripping since August, 1957, during which over 25,000,000 yards of stripping was removed. Concentration facilities consisting of washing, heavy media, heavy media cyclones, and spiral sections, will be placed into operation during the operating season of 1960. The Pierce mine is scheduled to produce 1,500,000 tons of direct ore and concentrates this year.



Zinc Firms Cooperate in Tennessee Project

An annual output of 35,000 to 40,000 tons of zinc concentrate is expected when full production is reached on land to be mined by Tri-State Zinc Company by an agreement with American Zinc, Lead and Smelting Company which controls the property near New Market, Tennessee (See MINING WORLD, June 1960, page 57). The new mine is south of New Market and about 1⅛ miles southwest of American Zinc's Graselli mine. Present ore reserves are said to be 17,000,000 tons of approximately 3.5 percent zinc ore. Under the agreement, which will accelerate the mining development, Tri-State will complete diamond drilling to prove indicated reserves and immediately thereafter sink mine shafts or inclines to bring the mine into production at the earliest possible date. An investment of $3,000,000 to $4,000,000 is involved on the part of Tri-State, operator of zinc mines in Illinois and Virginia, and a subsidiary of Consolidated Gold Fields of South Africa Ltd. A 3,600-ton-per-day concentrating plant will also be built by Tri-State on American Zinc's Graselli mine property.

ARIZONA

Erection of a dry separation plant at the **Applington Placers,** near Quartzsite, Arizona, is almost completed. This plant, in the nature of a test or experimental plant, is being erected by Silas P. Silverman and Associates of Phoenix with Andy Zinkl handling actual construction work. The unit is expected to be capable of treating 8 to 9 tons of screen concentrates per hour, and some 5,000 tons of gravel have been stockpiled awaiting completion of the test plant.

Transarizona Resources, Inc., Casa Grande, Arizona, is making rapid progress with mill construction and expects to have the recovery plant in operation soon. This plant, which will use the new segregation process of copper recovery, has a rated capacity of about 250 tons of ore per day. Salt for the chloridizing furnace is being trucked from Carlsbad, New Mexico, and regular production is expected to require about a carload a week. In the mine itself, drilling of the first regular work bench is already underway.

Several shipments of cement copper have been made to the International smelter at Miami by lessees working the **Mame** mine of **Hope Mining and Milling Company,** near Courtland, Arizona. Production currently is running about one ton of cement copper daily, but the operators hope to double this output in the near future. Operations are directed by William Ward, of Tombstone, Arizona.

Finishing touches are being put on the seven miles of new track being built by the **Southern Pacific Company** to service the **Mission** mine of **American Smelting and Refining Company.** The spur connects with company's Nogales branch line at a point 18 miles south of Tucson, Arizona. In addition to this spur outside Asarco's property, Southern Pacific has built 1½ miles of trackage inside the area. Shipments of concentrates from the Mission mine—to the Asarco smelters at Hayden or El Paso—are scheduled to start next year.

Cyprus Mines Corporation, Bagdad, Arizona, expects to complete the 500-foot shaft at the **Copper Queen** mine early in August. The shaft is being sunk under contract by **Centennial Development Company** of Eureka, Utah, and Tucson, Arizona, with Charles Stubblefield foreman in charge. Work is going forward two shifts per day, with a crew of seven. The shaft has already reached a depth of 300 feet, where a station was cut. The Copper Queen mine is two miles from the company's producing **Old Dick** property, and the current work is to develop a mineralized area disclosed by diamond drilling.

About 10 cars of gypsum ore are shipped each week from the **Winkelman** mine of **Arizona Gypsum Company** to the Rillito plant of **Arizona Portland Cement Company.** The ore comes from the company's open-pit where it is loaded by means of a ¾-yard Marion Shovel and hauled to the screening plant by two 10-ton Ford trucks. A larger Euclid truck is used to haul the screened product to the railroad. In addition to the cement gypsum, the company produces a minor quantity of agricultural gypsum, ground to 85 per cent through 100 mesh and marketed in 100-pound bags. J. M. Champie, Winkelman, Arizona, is mine superintendent.

The **Arizona Michigan Mining Company** and the **Oro Fino Mining Company** have merged and in the future mining operations at the **Silver Crown** mine will be conducted under the name of **Arizona Michigan Mining Company.** Company officials include A. V. Smith, president, of Mason, Michigan; and Langley W. Rayner, vice-president and general manager, Prescott, Arizona. The Silver Crown mine and mill are located in the Walnut Grove District of Yavapai County, Arizona. It has been in regular production for more than a year.

Armando and Oswaldo de la Ossa of Nogales, Arizona, operators of the **Pride of the West** mine in the Duquesne district, are making small shipments of lead-zinc-copper ore to the Trench mill, operated by **Nash and McFarland.** These shipments have been averaging about 50 tons monthly. The mine is owned by **Nash Mines,** Austin, Texas.

Mining and milling of lead and zinc ores continue at the **Flux** mine and its Trench mill in the Harshaw district of Santa Cruz County, Arizona, with an operating crew of 47 men. Of these, 38 are working in the mine, 7 at the mill, and 2 in the shops. Both mine and mill are worked two shifts, six days a week, and total production is approximately 3,100 tons monthly. In addition, the Trench mill treats some custom ores. The lead concentrate is shipped to **Asarco** at El Paso, and the zinc concentrate to Amarillo, Texas. E. W. McFarland, Nogales, Arizona, is manager.

Bagdad Copper Corporation, Bagdad, Arizona, has announced its decision to proceed immediately with the construction of a plant to produce copper by the leach and iron precipitation methods. Estimated cost of the project is $2,000,000, of which $1,500,000 has been obtained as a loan from the Valley National Bank. The balance will come from company funds. David C. Lincoln, president of Bagdad, said that engineering and construction are expected to take approximately a year and that the new plant should be in full operation by May 1, 1961. The company hopes to recover 40,000 pounds of copper per day from the oxide stockpile. An adequate amount of ore is already in place to conduct the leaching program for some time, and more oxide ore is stripped daily to get at the ore for the regular mill. Bagdad produced 23,950,907 pounds of copper last year.

Kennecott Copper Corporation is expected to issue an early call for bids for shaft work at its holdings near Safford, Arizona. Present plans, it is reported, call for a two-compartment shaft, about 1,000 feet in depth and suitable for two cages. Annan Cook, geologist in charge of the exploration work, and Lowell B. Moon of New York, development manager, have been in Salt Lake City conferring with other company officials on details of the project. Kennecott purchased the Safford property in 1959, paying approximately $4,000,000 for a block of some 120 mining claims aggregating about 2,000 acres. The purchase followed an extensive drilling program started in 1956, at which time geological investigation had indicated the possibility of a large copper deposit. The existence of such a deposit was later confirmed. Kennecott has stated that in grade a large segment of the ore compares favorably with that of the company's other western properties, although it lies buried beneath lava flows at various depths. The tonnage indicated is said to be sufficient to warrant plans for future mining, although there are still numerous engineering and metallurgical problems to be solved and it will still be some time before the economic potential of the deposit is fully ascertained.

The Swastika Silver Copper Mining Company, near Cleator, Arizona, is crosscutting on the 300-foot level of its Curtin shaft. The crosscut starts from a point in the drift level about 100 feet north of the shaft station and has been advanced about 275 feet. Bill White is superintendent.

El Dorado-Plumbago Gold Mine Reopened

El Dorado Plumbago Mine, Inc., is carrying out an extensive mine development program at the old Plumbago and El Dorado mines at Alleghany, Sierra County, California. This picture was taken while sinking the winze from the main adit level to the new 350-foot level. The winze was completed early this year and drifting on the vein has continued in two directions from the bottom. Two ore shoots have been intersected on the new bottom level. Gold bearing quartz ore was mined from the four to eight-foot wide vein above the adit level when the mine was operated in the 1930's. Reopening started in 1955 with extensive work being done during 1959. The company's 50-ton-per-day mill at the portal of the main adit has been rebuilt and equipped with a ball mill, flotation machines, and a concentrating table. A new machine shop building which houses the miner's dry, blacksmith shop, and compressors has also been built at portal.

The Tuba City mill of **Rare Metals Corporation of America,** Tuba City, Arizona, is continuing operations at its normal rate of 300 tons per day. During 1959 the plant processed 108,021 tons of ore, with an average of .289 percent uranium content. The major source of ore is the **Orphan** mine at the Grand Canyon, and to a lesser extent the company's mines in the vicinity of Cameron, Arizona. These mines produce about 2,000 tons per month, all of which are mined on contract by the **Cameron Mining Company.** Cameron also produces from a number of other mines in the district—some of which it owns and others which it operates under contract. These operations, together with some independent production, produce 1,500 or more tons per month. Carl F. Gommel is mill superintendent for Rare Metals.

Principal operations of the **Union Gypsum Company** are now centered at the old **Harless** mine, about 12 miles from Winkelman, Arizona. The present pit, as stripped, is about 1,000 feet long, and from 450 to 500 feet wide. It ranges from 0 to 30 feet in depth. The average grade of ore is said to run more than 90 per cent $CaSO_4$ and several hundred tons per day are mined, screened and trucked to Winkelman for rail shipment to the company's plant in Phoenix. Union Gypsum was acquired recently by **National Gypsum Company** of Buffalo, New York, through an exchange of stock.

CALIFORNIA

Bisso & Lord Mining Company of Contra Costa County, California, reports indications of chromium ore, as well as chrysolite on its property on Mt. Diablo at an elevation of 2,000 feet. Copper ore was the first mineral found on the property. Bisso-Lord has made an agreement with **Johns-Manville Company** for mining the chrysolite, which will be processed at that firm's plant in nearby Pittsburg, California.

The **Jack Waite Mining Company** has leased 100 patented and unpatented mining claim in San Bernardino County in southern California. According to Philip A. Borelli of New York, president, geological reports indicate deposits of millions of tons of gold-bearing fractured limestone, with a reported grade as high as 1.06 ounces per ton in gold on some of the claims. Deposits are high up on canyon walls so that mining can be fairly low-cost. The company plans to start an exploration program immediately.

The executive committee of the Western Mining and Minerals Council Inc., meeting recently in Bakersfield, California, announced a plan for forming six new chapters in Los Angeles County. Among subjects under discussion was the Hearst-Skipper Gold Medallion Proposition which calls for the state of California to buy $85,000,000 worth of native gold mined after January 1960 for $55 an ounce. This would be used to mint gold commemorative medals, placting them on the open market at $60 an ounce. More than 10,000 signatures supporting this proposition have already been received, and the movement is spreading to Arizona, Nevada and New Mexico.

A $250,000 dolomite ore processing plant is planned for construction in the Lucerne Valley, California, area by **Sentinel Mining Corporation,** which has recently leased a large dolomite deposit.

NEVADA

According to Mervin Gallagher, Nevada state mine inspector, the mining picture in the state is looking up, with some 4,800 men now working full time in 145 ore-producing properties in the state. Almost every county has at least one producing mine. A few counties, however, such as Lincoln, are still suffering from collapse of the tungsten and lead-zinc markets. In Storey county on the Comstock new underground activity has been started for the first time since 1950, with the **Eldorado Company** engaged in exploration at the **New York** and **Keystone** mines. The New York shaft is being used and exploration is being carried out at the 800-foot level and below.

Several encouraging assay reports have been given about a magnetite iron deposit recently located in Nevada, according to August Chopp of **Jarco Mining Company** which operates the Minietta lead and silver mines in the Argus Range out of Panamint valley. One report shows iron 68.4 percent; silicon 3.21 percent, phosphorous .016 percent with small amounts of other minerals. Extent of the deposit has been estimated to be at least 4,000,000 tons.

At its Trinity Mountain property 20 miles west of Lovelock, Nevada, **Eagle-Picher Company** has developed a new open pit of filter grade diatomaceous earth. Mining continues in the original pit where a considerable ore body has been developed. The new mine has an area of about 15 acres, while Pit No. 1 is about 30 acres.

Tonopah Mining Company, historic old producer of early mining days in the Tonopah Nevada, area, was purchased recently by Leroy David and Nick Barbarich, who hope to reopen the famous property for mining operations. The sale included 15 patented mining claims, including some of the most renowned in the area's mining history, as well as a considerable amount of land that may be used for housing and anticipated expansion in the area. The Tonopah Mining Company was the first to start operations in the mining area and had an outstanding record for both tonnage and value of silver-gold ore produced.

Siskon Corporation of Reno, Nevada, which last year acquired stock control of **Nevada King Copper Company,** undertook a drilling program on the Nevada King property in the Maggie Creek mining district, Eureka County, Nevada. Before winter weather ended operations temporarily, nine holes were drilled and copper ore encountered in several. Nevada King owns eight or more patented mining claims from which more than 180 carloads of ore have reportedly been mined and shipped in the last several years. Average copper content was more than 30 percent. Siskon's principal operations are in Siskiyou County, California.

Drilling at its Pizarro and Inca silver claims near Hamilton, Nevada, is planned by **Sidney Mining Company,** of Kellogg, Idaho, as part of the company's program to shift emphasis from lead-zinc to gold, silver, and uranium. The $200,000 program will concentrate on opening deposits of these metals in central Idaho as well as in Nevada.

A core drilling program is planned by the **Belmont Mine Company** at its **El Dorado South** mine in Nevade for further development of ore bodies before more underground exploration is attempted.

NEW MEXICO

A current production rate of 10,000 tons per month from its **Mary No. 1** uranium mine is being maintained by **Entrada Corporation,** headquartered in Albuquerque, New Mexico. Development of four other properties for mining operations is also under way. Reserves are placed at more than 8,000,000 tons of mining grade ore, including more than 5,000,000 tons of .20 percent grade, for which the company has a contract to sell to the Atomic Energy Commission. These reserves have been established on a small portion of the company's New Mexico uranium properties including a net interest of 6,400 acres in the Ambrosia Lake area. The firm also holds more than 7,000 acres in the new Churchrock producing field near Gallup, and the area between the two major fields. The Mary No. 1 mine is operated under a profit-sharing agreement by **Boyles Bros. Drilling Company** of Salt Lake City, Utah.

Work at the Bingham project southeast of Socorro, New Mexico, has indicated a substantial tonnage of lead-fluorspar ore which could be mined at a profit under favorable market conditions. However, at 12 cents per pound for lead and with no assured fluorspar market, the operating **Sunshine Mining Company** questions whether the property can be placed in production at this time. Exploration was started in 1958 and last year a total of 1,204 feet of drifting and crosscutting, and 126 feet of raising was completed. About 450 feet of drifting and crosscutting has been done this year. Robert H. Hardy, Jr., Spokane, Washington, is president of the company.

Operations were expected to be under way in early June at the **White Star** mine near Columbus, New Mexico, operated by W. A. White of Deming, with Jim Patterson as general manager. The operation includes four big leaching pits, new equipment, and a stockpile of ore.

Kennecott Will Sink Winze On East Tintic Property

Development work at the Burgin shaft in the East Tintic District of Utah will be started soon by Kennecott Copper Corporation. The firm recently obtained permission from the Utah State Mine Inspector to sink an interior winze passageway to develop ore found by drilling below the present level.

The winze will be sunk at a 30-degree angle about 1,000 feet west of the Burgin shaft. It will be about 500 feet long with a vertical depth of 200 to 250 feet.

Exploration work has been carried on for more than three years by Kennecott's subsidiary, Bear Creek Mining Company. Underground exploration from the 1,100-foot Burgin shaft has been conducted by means of cross-cutting on the 1,050-foot level and by diamond drilling below the level.

Kennecott has acquired the leases under which Bear Creek has been working. Exploration on the leased ground in the district will be continued by Bear Creek, which has been prospecting for several years under a multi-million dollar arrangement with Chief Consolidated, Tintic Standard and other mining companies in the area.

Reports unconfirmed by Kennecott estimate that 1,000,000 tons of high-grade ore have been located. Exploration in the Tintic area began in the 1860's with peak production occurring in the 1920's. Estimates put past profits of mines in the area at about $100,000,000.

Rocky Mountain Mineral Law Institute To Be Held in July

The sixth annual Rocky Mountain Mineral Law Institute is meeting July 28, 29, and 30 at the University of Colorado in Boulder. The session is sponsored by the Rocky Mountain Mineral Law Foundation, which includes law schools and bar associations of various Rocky Mountain states, as well as mining associations in the area.

Among topics of interest to the mining industry will be "Enlarging the Prediscovery Rights of Mineral Locators"; a panel workshop on "Significant Developments in the Law of Oil and Gas and Mining"; "A Comparative Study of the Mineral, Oil and Gas Laws of Mexico and the United States"; a workshop on "Developments in the Law of Mineral Taxation," and "Law of Subjacent Support and the Right to Totally Destroy Surface in Mining Corporations."

Registration fee for the institute is $30. Accommodations for individuals or families can be provided in University residence halls near the place of meeting at a reasonable cost. A steak fry Thursday evening and a reception Friday are among events scheduled.

Du Pont Plans Drilling on Colorado Columbium Claims

An exploratory drilling program to be carried out this summer by geologists of E. I. du Pont de Nemours & Co. in Colorado will include driving a tunnel to study the extent of one columbium ore body on its mining claims.

Two years ago Du Pont purchased patented and unpatented claims of the Gunnison Syndicate, as well as all rights in the property held by Humphreys Gold Corporation. The property near Powderhorn, Colorado, in the White Earth mining district of Gunnison County, covers about 4,500 acres.

The company still has no plans for commercial mining of the property which was acquired as part of an overall development program in the field of columbium metal, which is of particular interest in the manufacture of jet engines and other aircraft components.

The Colorado ore is reported to be of variable grade with reserves estimated at 100,000 tons of columbium oxide.

$3,000,000 Wyoming Gypsum Plant Under Construction

Construction of a $3,000,000 gypsum board plant was begun recently at Cody Wyoming by Big Horn Gypsum Company, a new firm headed by Sid H. Eliason. Big Horn is acquiring the 41,000,000-ton gypsum deposit 4½ miles south of Cody that has been leased from the Taggart family of Cody. The deposit is expected to furnish enough raw material to produce 100,000 board feet of gypsum board yearly.

The recently organized **Silver Plume Mining Company** during the last year has acquired some 300 mining claims in the Silver Plume, Colorado, area, including the **Burleigh** tunnel and well-known mines such as the **Dives-Pelican, Seventy-Thirty** and the **Bismarck**. The company hopes to put some of the early day mines into production again as a result of work now going on in the Burleigh tunnel. Principal members of the new company are Dr. J. M. Hoxsey and J. W. McCormick, Jr. both of Dallas, Texas, executives of the **Hoxsey Oil Company.**

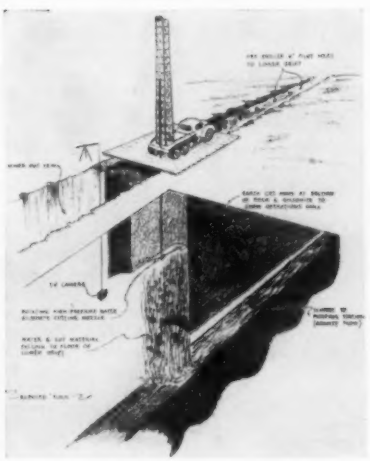
Discovery of an unusual find of gold and silver bearing ore at surface has been reported by **Marbrus Company,** Boulder, Colorado mining firm headed by Marlin Brusberg. A 20-foot shaft, sunk on the property in Sunshine Canyon, northwest of Boulder, has yielded samples from pockets assaying 1,700 ounces of silver to the ton, in addition to high gold content.

During the last ten months 12 Colorado uranium mines were ordered to cease operations because of radioactive concentrations averaging 50 times above the safe working level, according to the State Public Health Department. An emergency program set up last July gave that department two inspectors to check mine radiation levels, but the legislative appropriation for this purpose has been exhausted. Although medical studies of Colorado uranium miners are incomplete, and conclusions are difficult because the uranium industry is so new and miners move frequently, the facts now available are "disturbing," said P. W. Jacoe, of the health department's occupational health section. Incidence of lung cancer and other radiation-connected disease is higher among Colorado uranium miners than the population generally, he said.

An increase of more than 40 percent over 1958 production was achieved by **Climax Molybdenum Company,** Division of **American Metal Climax, Inc.** at its Climax, Colorado, mine in 1959. Total tonnage mined was 9,092,000. During the year the company started a program to maintain the long-term ability of the mine to produce at high capacity, initiating development work on the third, and presently deepest, mining level. The work involves progressive installation of more underground and surface facilities to permit ore production from this area starting in 1968, when the Phillipson level will be nearly mined out. Total ore reserves are calculated at 463,000,000 tons

American Gilsonite Uses Vertical Mining System

A radically new high-pressure hydraulic mining method that virtually eliminates need for all underground timbering is used by American Gilsonite Company at its expanding Bonanza, Utah mine. The new method, illustrated here, uses drilling equipment mounted on a surface truck supported on a platform just above the narrow gilsonite vein which is exposed on the surface. Vertical holes are drilled through the center of the vein to intersect the bottom drift. Hydraulic high-pressure nozzles are substituted for drill bits and lowered to the bottom drift. Water at 2,500 pounds per square inch is then directed against the wall of the hole to tear the ore free so it falls into the drift below. At that point, a stream of low-pressure water carries the ore as slurry by gravity flow to other handling facilities in the mine which eventually pump the ore to the surface. Note proposed use of television camera suspended by cable from surface to monitor cutting operations.



which contain, before dilution in mining, more than 2,000,000,000 pounds of molybdenum. Production of tungsten as a byproduct of the Climax operation was more than double the 1958 output, totalling 890,000 pounds. Both higher mine production and improved recovery through full operation of the expanded byproducts plant were reflected in the increase. Minor values in tin and pyrite were also recovered.

United States Manganese Corporation is continuing its development of processes to produce manganese from domestic rhodonite ores. Owned by **Vitro Corporation of America, Sheer-Korman Associates, Inc.** and **Great Divide Mining and Milling Corporation,** the development firm holds substantial rhodonite claims in the Silverton, Colorado area, as well as exclusive license to produce manganese compounds by the Sheer-Korman Hierarc process, which employs a unique electrochemical phenomenon.

UTAH

Activity of several well-known companies in the Topaz Mountain area of Western Utah has given rise to speculation about a beryllium prospecting boom. **Beryllium Resources Inc.** of Salt Lake City, which has acquired three claims in the area, reportedly discovered a non-pegmatic beryllium ore deposit in the area. **Vitro Chemical Company** has obtained about 10 claims, while **E. I. Du Pont de Nemours & Co.** was rumored to have an interest in land about 50 miles northwest of Delta in Millard County in the Thomas Range. Other firms mentioned in connection with the prospecting activity are **Food Machinery and Chemical Corporation, Combined Metals Reduction Company and Hidden Splendor Mining Company.** Claim arguments and the fact that some property is located on previous uranium and fluorspar claims have complicated the situation.

Geology of the East Tintic district of Utah, a famed silver-lead-zinc producing area, is shown on two new maps available from the **United States Geological Survey.** One geologic map shows distribution of the Paleozoic sedimentary rocks and the Eocene igneous rocks, without distinguishing altered areas. A colored alteration map shows types of alteration without naming geologic formations.

Vanadium Corporation of America has paid $1,581,000 for more than 1½ million pounds of fused vanadium as a result of public auction of the metal at Grand Junction, Colorado, by the Atomic Energy Commission. It was the first sale of a portion of AEC's 11,000,000 plus pounds of fused vanadium pentoxide (V_2O_5), which amount represents nearly a year's consumption of the metal by a domestic industry. VCA paid $1 per pound for the vanadium metal—topping by ⅛ cent a pound the bid of **Union Carbide Metals,** its principal competitor in the domestic vanadium industry.

The Garfield, Utah, cobalt refinery of **Calera Mining Company** in Salt Lake City has been purchased by **Minerals Engineering Company** of Grand Junction, Colorado. The new owner will use the refinery for producing high purity vanadium pentoxide.

Development of a substantial lead-silver-zinc ore body in the Park City mining district of Utah may result from an agreement between **Keystone Mining Company** and **United Park City Mines Company** for a joint enterprise. The new area of exploration is reportedly an extension of ore bodies in the Keystone area, about which ownership disputes arose in past years. The exploration program would involve drifts and crosscuts into the area to be mined from the 900-foot level of the Silver Hill section formerly owned by **Silver King Coalition Mines Company.** The Silver Hill area in the past produced more than 1,000,000 tons of high grade ore, while the Keystone produced about 100,000 tons before it was largely mined out to depth in the Crescent Fissure about 35 years ago. United Park City is also starting development of an extension to reserves by sinking a 400-foot incline winze from the 1,800-foot level to the 2,000-foot level in the Ontario section of its Park City mine. Expectations are that more than 100,000 tons of ore will be made available by sinking the winze, and it may be possible to carry out mining thousands of feet below the 2,000 feet level in the Humbug formation.

Overall grade of ore and tonnage produced during 1959 by **United States Smelting and Refining Company's** Utah operations were slightly lower than the previous year. Tonnage of new ore developed was approximately equal to tonnage extracted. At its **U. S. and Lark** mine, work on the lowest level, the 3,500 level, in the U. S. Section did not develop commercial ore so the level was abandoned. The company continued operations at its Midvale, Utah mill, but shut down its smelter. Lead concentrate and custom smelting ores, concentrates and other smelting materials were treated at the Tooele, Utah plant of **International Smelting and Refining Company.**

An agreement that will lead to establishment of one of the country's largest potash mining operations has been completed by the **Delhi-Taylor Oil Corporation** and **Texas Gulf Sulphur Corporation.** The project on Delhi-Taylor properties near Dead Horse Point, San Juan and Grand Counties, in Utah, will start next year. Cost has been estimated at more than $20,000,000 and initial employment at 300. Delhi-Taylor has been negotiating for some time with mining firms about development of his huge potash reserves, estimated by the company last year as "sufficient to supply production of 1,500 tons per day for 40 years."

Two editions of a new map of Utah have been published recently by the **United States Geological Survey.** The planimetric base map edition is in three colors and shows only water and cultural features. The nine-color topographic edition shows land forms, national forest, national parks, Indian reservations and cities, towns and villages. Both are at the scale of 1,500,000—about eight miles to the inch.

WYOMING

Hamlin Exploration & Mining Company, which has been mining uranium in Wyoming since 1957, is now producing from a new mine near Turnercrest. In March the company shipped from its Chrysops claims 615 tons which assayed 0.153 percent U_3O_8. Current production is running about 0.21 percent uranium. The ore lies in thin bodies and pods that are selectively mined after removing from 3 to 15 feet of overburden.

Globe Mining Company has been awarded an award, The National Safety Council's President's Letter, for working 63,951 man-hours during 1959 without a disability injury. Globe Mining, a unit of **Union Carbide Corporation,** operates several uranium mines and a mill in the Gas Hills area of Wyoming.

A shaft is being completed by **Hidden Splendor Mining Company** at the **Lisbon** mine in the Gas Hills district of Wyoming. The Sunset properties in the same area have been made ready for open pit mining through stripping of approximately 700,000 cubic yards of overburden. Removal of ore from this property began in March. No mining operations are scheduled to start in the near future, since operations are being geared to milling contracts and capacity, and to contracts with the **Atomic Energy Commission** for sale of uranium oxide.

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ALASKA

Sunshine Mining Company, northern Idaho silver producer, is participating in a helicopter reconnaissance of two Alaskan areas. One is an area northwest of Mount McKinley where high grade silver mineralization has been found. The other is the Mount St. Elias area where receding glaciers have left outcrops exposed.

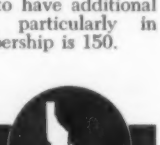
Newmont Mining Corporation, worldwide mining firm with headquarters in New York, is establishing a 30-man exploration camp atop Brady glacier about 100 miles north of Juneau, Alaska.

Frank E. Birch, Spokane, Washington, mining engineer, his wife and three children have returned to the Chandalar gold mining district in Alaska along with Robert Nusbaum, a University of Idaho graduate. Birch and Nusbaum this season hope to do more than 600 feet of drifting on gold-bearing veins at properties of **Little Squaw Mining Company**, owned by **Grandview Mines, Inc.** and **Metaline Mining and Leasing Company** of Spokane, Washington.

Frank D. Duval, Spokane mining research statistician, has gone into a hydraulic gold placer mining operation at Lake Clark with Terry Gill, veteran Alaskan mining operator.

New headquarters for the Alaska Miners Association is Fairbanks, where the address is P. O. Box 1170. James D. Crawford is president; John C. Boswell, secretary-treasurer, and Carl Parker, Harold Strandberg, Charles Herbert, James Crowdy, and Charles Johnson, vice presidents. The AMA has active branches in Fairbanks, Anchorage, and Seattle, and the officers hope to have additional branches established, particularly in Ketchikan. Total membership is 150.

IDAHO



Sidney Mining Company has reported encouraging results in diamond drill exploration of its Bayhorse District properties in central Idaho. Mineralization is lead, zinc and copper.

Sunshine Mining Company has decided to install a system of pumping mill tailings in the **Sunshine** mine, Shoshone County, Idaho to fill mined-out areas. Savings of up to $1 a ton are expected over the present method of filling with waste rock obtained from development and exploration work. Two new silver ore discoveries made in cross-cutting to a proposed new east-end development shaft on the 3700 and 4000-foot levels may necessitate a change of location. The orginal site is being reappraised. Sunshine's cathode antimony metal (95 percent antimony and 5 per cent arsenic) is finding growing acceptance among producers of antimonial lead products. Sales in the first four months of this year totaled 692,000 pounds. Robert M. Hardy Jr., Spokane, Washington is president.

The Frank Marr leasing operation in old upper workings of the **Bunker Hill** mine at Kellogg, Shoshone County, were closed by a labor strike at the Bunker Hill Company operations. The lessee's ore concentrates had been going to the Bunker Hill smelter. Fifteen workers were idled.

Development of 62 mining claims in the Lemhi Pass area of Lemhi County, near Salmon, is planned by a new Idaho firm, **Monida Thorite, Inc.** Incorporators were Clinton A. Gunderson and Clair Meeks, Salmon, Idaho and Dale Larsen, Salt Lake City, Utah.

A flat fault 95 feet above the 1000-foot level in the **Dayrock** mine, Shoshone County, Idaho cut off the rich Hornet vein found on the 1000 level. Probing of the walls at last report had failed to disclose an upward continuation of the structure. The mine is owned and operated by **Day Mines, Inc.**

Core drilling of iron ore showings in the Gold Hill mining district near Princeton, northern Latah County, Idaho has been undertaken by a test crew from Ironton, Minnesota, representing the **Adams Winston Western Syndicate**, Duluth, Minnesota. Steven Blanich is in charge of the work.

San Francisco Chemical Company is reopening the Waterloo phosphate mill at Montpelier, Bear County, Idaho, and plans to operate the mill 24 hours daily, seven days a week. Phosphate rock will come from a new open-pit mine in Diamond Gulch on the Bear Lake-Caribou county line. Joe Herrera, Montpelier, is mill supervisor. R. K. Barcus is assistant general manager for the firm.

The **Galena** mine, Shoshone County, Idaho, yielded approximately 4,500,000 ounces of silver in 1959 to put it in second place among United States silver producers. Production totaled 118,000 tons of ore averaging 39 ounces of silver and 1.7 percent copper to the ton. The main Galena shaft was deepened 500 feet to service the 4000-foot level. Exploration work westerly from the shaft on the 3000-foot level towards the Argentine claim, leased last summer, encountered an unknown vein north of the Polaris Fault in a virtually unexplored area. The vein so far has been opened for more than 250 feet and contains high silver values although averaging only about two feet in width. The mine is operated under long-term profit-sharing lease by **American Smelting and Refining Company. Day Mines, Inc.**, has a 25 percent operating interest in the lease. The property is owned by **Callahan Mining Company.**

At the famed old **Hercules** mine, Burke, Shoshone County, Idaho, a small crew is removing a final pillar of good silver-zinc ore adjoining the main shaft. This extraction soon will be completed and the workings again allowed to fill with water. A fabulous producer from upper levels from 1902 to 1925, the mine was unwatered in 1947 and 1948 by **Day Mines, Inc.** and ore developed in the far western part of the mine on the 1000-foot level. Development has reached a depth of 1,600 feet but ore reserves no longer can be mined at a profit at today's metal prices. Since reopening the Hercules 13 years ago, Day Mines has produced 204,000 tons of ore for net smelter returns of $2,550,000. Expenditures, however, totaled $4,150,000.

At the **Galena** mine in the Silver Belt west of Wallace, Idaho westerly drifting on the "North" vein found several months ago has opened two high grade ore shoots totaling 346 feet in length and averaging 2½ feet in width. The discovery was on the 3,000-foot level. The No. 3 shaft headframe has been finished and shaft sinking started. The Galena is owned by **Callahan Mining Company** and operated by **American Smelting and Refining Company. Day Mines Inc.**, has a 25 percent operating interest in the lease.

Clayton Silver Mines. Custer County, Idaho is producing lead concentrates at a rate of four or five cars monthly. Mine output is 2,700 to 3,000 tons of ore per month. The firm currently is marketing a large stockpile of zinc concentrates. W. M. Yeaman, Yakima, Washington is president.

Yieldable steel arch sets have been installed in repair work at the 1,200-foot station of the **Page** mine near Kellogg, Shoshone County, Idaho. Shaft repair work at the **Morning** mine near Mullan has reached the 2650 station. Both mines are owned and operated by **American Smelting and Refining Company.**

Lucky Friday Silver-Lead Mines Company's new mill in the Hunter district of the Coeur d'Alene mining region, east of Mullan, Idaho is producing 80 tons of lead concentrate and 1¾ tons of zinc concentrate daily. It is handling 500 tons of ore daily. Milling costs are about half what they were at the Golconda custom mill. Millheads averaged 18.3 ounces of silver, 9.1 percent lead, and about 1 percent zinc in the first three months of this year. Production of 26,826 tons of ore brought a first quarter net income of $240,000 for the district's **Cinderella** mine, now controlled and operated by **Hecla Mining Company.** The 2,600-foot level of the mine currently is being prepared for mining and a station pocket has been cut on the 2800 level.

The **Silver Summit** mine in the Silver Belt of the Coeur d'Alene mining region, west of Wallace, Shoshone County, Idaho is yielding between 1,600 and 1,700 tons of ore monthly, with most of the production coming from stopes above the 2,800 and 3,000 levels. Exploration of the 1,750-foot level has been disappointing and mine reserves were down to 6,000 tons as of April 1. Ore reserves have been exhausted in the Rainbow area, developed from the 3,000-foot level of the Silver Summit mine, and the area is being abandoned. **Hecla Mining Company** owns Silver Summit.

At the **Star** mine near Burke, Shoshone County, Idaho workmen are starting to sink the main shaft below the 6,300-foot level to open 6,500 and 6,700 levels. Production recently was stepped up to 1,000 tons daily to help supply a fifth unit at the **Bunker Hill Company's** electrolytic zinc plant near Kellogg. The Star, Idaho's largest zinc mine, is owned by **Bunker Hill** and operated by **Hecla Mining Company.**

MONTANA

The Anaconda Company's $11,000,000 development program for the Butte, Montana mines (See Mining World, June 1960, page 57) could mean 1,000 new jobs in the Butte mines, according to Martin K. Hannifan, manager of mines for the company. The five-year expansion program designed to increase mine production from 2,000 to 5,000 tons daily will probably create at least that many new mining jobs. When the new program is completed, Anaconda will have a centralized hauling and hoisting system for five copper mines.

Further steps toward construction of a steel mill in Anaconda, Montana, were taken recently when an official of **Webb and Knapp** of New York, builders of the proposed plant, was in Anaconda for discussions with **The Anaconda Company** and **The Montana Power Company.** While the original plan called for a plant with a capacity of 300 to 400 tons daily, costing about $20,000,000, present discussions are directed toward one of 1,000-tons-per-day capacity, which would entail costs of over $40,000,000. Target date for production at the plant, if present arrangements work out, is the winter of 1962. The mill would utilize slag discarded from previous copper and zinc smelting operations. One of the biggest economic factors involved is the necessity of procuring a proper grade of limestone that is used as a flux in melting slag. Cost of power is also influencing the decision on plant construction.

The Montana Bureau of Mines and Geology has announced a new publication, entitled "Progress Report on the Clays and Shales of Montana, 1958-1959." It was written by Uuno Sahinen, Ralph Smith, and Donald Lawson. This free publication may be obtained from the Montana Bureau of Mines and Geology in Butte.

Three new firms have been chartered in Billings, according to Montana the secretary of state: **Barmont Mines Inc., Hi-Flo Inc.,** chartered for mining and drilling, and **Tracana Enterprises,** a mining firm.

OREGON

More than 100 geologic field studies are expected to be under way in Oregon this summer. More graduate students are doing work in Oregon for degrees in geology and the United States Geological Survey and Oregon Department of Geology and Mineral Industries are concentrating on completing the state mapping project. Only about two-thirds of Oregon's 96,000 square miles have been mapped geologically and about half of this has been reconnaissance. Relatively few stratigraphic and mineral deposit studies have been completed.

Northwestern Mining Council, Inc., Medford, Oregon has elected W. H. Holloway, president; Del Boyd, vice president; Mrs. Truman Bishop, secretary, and Glenn Hall, treasurer.

WASHINGTON

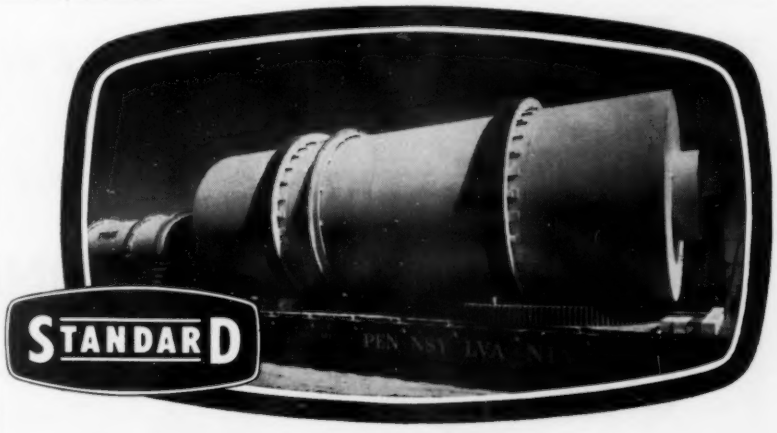
The old Mohawk property north of Conconully, Okanogan County, Washington is the scene of a new exploration project. Preparations are under way to develop a vein of copper-silver ore uncovered in bulldozing work last fall. C. J. Weller is manager and Cline E. Tedrow, consulting engineer.

The old **Schumaker** silver-lead-zinc mine on Joe Creek, northeast of Colville, Stevens County, Washington is being rehabilitated by **Triton Mining Company.** A crew has cleaned up and retimbered the 300-foot tunnel and plans to drift on an ore showing and possibly deepen a 30-foot winze. Company plans for this season at the **Kelly Camp** mine in Ferry County include installation of flotation cells in the gravity-type mill. Darrell Newland, is president of Triton and Cline E. Tedrow is consultant engineer.

Grandview Mines, Inc. is planning geochemical tests and some diamond drilling at its Stevens County, Washington lead-zinc properties this season. One of the properties adjoins the **Anderson** open-pit mine of **Goldfield Consolidated Mines Company** where a 1500-ton flotation plant is being planned. The **Grandview** lead-zinc mine near Metaline Falls, Pend Oreille County, is operated by **American Zinc, Lead and Smelting Company** under a purchase agreement whereby the Grandview firm henceforth will receive a graduated gross royalty from sale of all remaining ore.

Pend Oreille Mines & Metals Company milled a total of 619,779 tons of ore last year, about 12,000 more than in 1958, producing 15,636,497 pounds of lead concentrate and 21,636,820 pounds of zinc concentrates. The company operates in the Metaline district of Pend Oreille County, Washington. Expenditures for plant and equipment during the year, mainly for mine equipment, totalled $54,649.02.

"Iron and Gold" was the theme of the 1960 Prospectors' Day program scheduled May 7 at Republic by the Ferry County Prospectors Association. Governor Albert D. Rosellini and Marshall T. Huntting, supervisor, Washington State Division of Mines and Geology, were principal speakers, reporting on results of a state-sponsored aerial magnetometer survey of northern Ferry and Okanogan Counties last summer. The governor said that preliminary results of the survey indicate possibilities of large iron ore deposits. The program concluded with the traditional "Sourdough" supper and "Eureka Gulch" entertainment.



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Cerro de Pasco Acquires Control of Rio Blanco

Control of Rio Blanco Copper Corporation Ltd., has been acquired by Cerro de Pasco Corporation, which since 1955 has been exploring and developing the Rio Blanco copper orebody northeast of Santiago, Chile. Rio's principal asset is ownership of most of the capital stock of Compania Minera Rio Blanco Limitada, Chilean company that owns the mining claims.

Approximately 120,000,000 short tons of ore with an average grade of 1.58 percent copper has been indicated to date at the Chile property. Ore deposition is of the porphyry type and the efficient block caving method of mining can be used.

According to Robert P. Koenig, Cerro de Pasco president, his firm's experience in the Peruvian Andes will prove valuable in solving altitude problems at the Rio Blanco property, which lies about 11,000 feet above sea level. He anticipates that modern snow-moving techniques should enable operations to continue year-round, despite the unusually heavy winter snowfall in the area.

Cerro de Pasco, which will change its name to the Cerro Corporation next January, plans capital expenditures of $21,000,000 during this year. Largest amount to be spent in a single year for this purpose by the firm, it will be used for replacements and expansion of copper and aluminum fabricating plants in the United States; at mines, smelters and an oil venture in Peru, plus preliminary development in Chile.

Commonwealth Aluminum To Build Queensland Plant

The Commonwealth Aluminum Corporation will build a reduction plant on the Queensland east coast to treat aluminum oxide from Weipa on Cape York Peninsula. Commonwealth is jointly owned by British Aluminium Ltd. and by Consolidated Zinc Corporation, which is in the process of developing extensive bauxite deposits discovered in the Weipa area.

Latest reports from Weipa indicate there are at least 500,000,000 tons of known bauxite deposits there.

Agreement on the supply of power for the project, said to represent an investment of £A 20,000,000, is currently being negotiated by Commonwealth and the Queensland government, which is expected to supply power from Gladstone, south of Rockhampton on the Queensland coast.

Only other aluminum refinery in the area is at Bell Bay, Tasmania, operated by the Australian Aluminum Production Commission.

Alcoa To Develop 30,000-Acre Bauxite Property in Jamaica

A 30,000-acre site in Jamaica acquired recently by option will become a fourth major source of bauxite for Aluminum Company of America. The property in Clarendon Parish, west of Kingston and 15 miles from Jamaica's south coast, was optioned a year ago by agreement with the Jamaican government and Caribex Ltd., Canadian subsidiary of American Metal Climax, Inc.

A three-year construction and development program calls for production to begin by June 1, 1963. A geological examination of these Caribbean type bauxite deposits has just been completed. Bauxite ore will be shipped to Alcoa's Point Comfort, Texas, refining plant for extraction of alumina from which metallic aluminum is smelted.

Norman Manley, Jamaica's premier and minister of development, in commenting on the Alcoa operation, said the construction program, slated to begin about the end of this year, involves creation of port, harbor and transportation facilities, with an estimated expenditure of $15,000,000. Employment of about 500 persons is expected when mining operations commence.

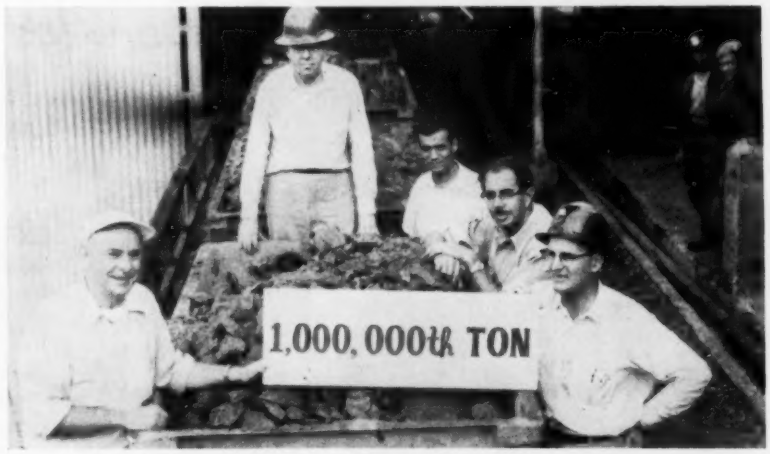
The new Jamaican development will supplement Alcoa's extensive bauxite mining operations in Surinam, South America (see MINING WORLD, May 1960, page 54); in the Dominican Republic, and at Bauxite, Arkansas. Alcoa is the fourth bauxite company to conduct mining operations in Jamaica.

OCEANIA

REPUBLIC OF THE PHILIPPINES—A 65 percent production increase over last year has been attained by **Acoje Mining Company** during the first four months of this year. A total of 50,312 dry metric tons of chrome concentrate was produced at its mill in that period compared with 33,040 dry metric tons in the same period last year. During April the company produced 13,242 dry metric tons of concentrate from 26,750 dry metric tons of milling grade ore. Concentrates produced average 48.21 percent chrome oxide. Ore was recovered at an average of 84.4 percent on a ratio of 1.96 to 1. Shipments amounting to 7,570 metric tons were made to Japan during April, making a total for the year of 35,153 dry metric tons compared to 27,682 dry metric tons last year.

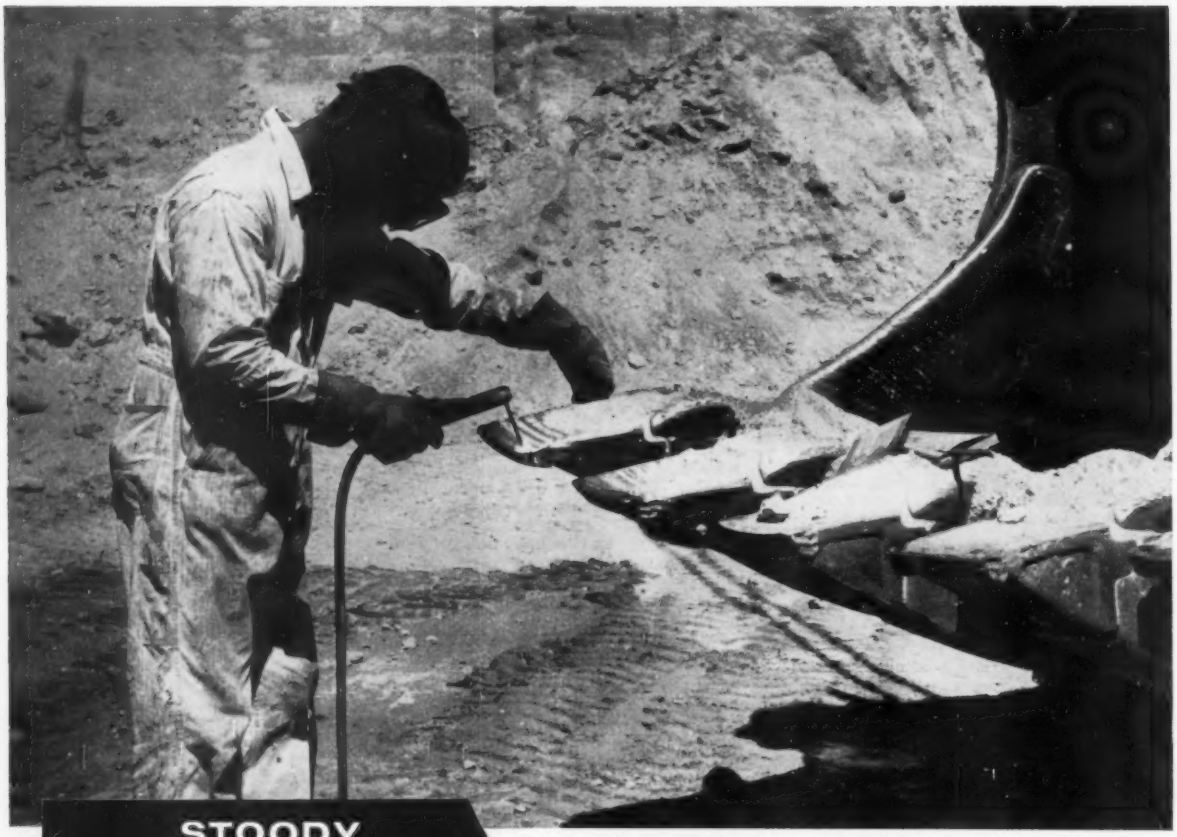
NORTHERN TERRITORY—The solvent extraction plant of **South Alligator Uranium N. L.** continues production. The new No. 1 level drive being driven eastwards to test for continuation of the Rockhole ore zone is now in high grade pitchblende ore, supporting the opinion that the Rockhole zone connects with the Skerrits outcrop. If this is correct, there are 1,000 feet of potentially ore bearing ground ahead of the new drive. Ore milled to date has averaged 1.03 percent U_3O_8. Both milling recovery of 93 percent and mill output are slightly better than expected. For a six-month period ended March 19, ore mined totalled 2,313 short tons, and ore milled was 2,660 short tons.

WESTERN AUSTRALIA—First step in a long-range plan to establish an alumina industry in Western Australia came with approval by the government of the mining and export to Japan of 1,250,000 tons of bauxite during the next five years. The approval was given to **Western Mining Corporation** and its associate, **Western Aluminum Company**, for export of three trial shipments. If shipments and negotiations succeed, up to 300,000 tons of bauxite yearly will be sold to Japan. The bauxite deposits are in the Darling Ranges



Philex Mines 1,000,000th Ton of Ore

When Philex Mining Company in the Philippines mined its 1,000,000th ton of copper-gold ore recently, George O. Argall, Jr., editor of MINING WORLD, was on had to mark the important milestone. Pictured at the special event which took place May 31 despite Typhoon Lucille, are, left to right, Ralph J. Seideman, general superintendent; Mr. Argall; George Henry, mine superintendent; Albert Pessin, metallurgical consultant, and George Scholey, general manager. The picture shows how uniformly the ore has broken during block cave mining, which has proved the fastest, most economical method for underground mining of this massive disseminated copper ore. There is no secondary blasting in fingers or on grizzlies. The 1,000,000th ton was also the 200,000th ton from the 1C-1 block cave stope. Although the typhoon dumped more than five inches of water into the Philex pit and on top of the block cave stope in ten hours, mining was not interrupted and ore drawing continued at the normal rate because methods have been perfected for production in any weather conditions. Philex mined its first ore from its Santo Tomas ore body July 5, 1958, and has been milling at a capacity of 1,850 tons per day for more than a year.



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parallel to the West Coast where Western Mining has been testing for the last 18 months. Mining operations are likely to be centered at Dwellingup, about 60 miles from Perth.

QUEENSLAND—Production for four weeks ending May 1 for **Mt. Isa Mines Ltd.** totalled 49,281 tons of lead ore; 3,850 tons of lead bullion; 2,212 tons of zinc concentrate; 150,432 tons of copper ore, and 1,940 tons of blister copper. Concentrates railed from the mine to Townsville for shipment to Japan totalled 11,541 tons. The company recently announced its largest bonus issues of shares, in the ratio of one for three held. Present ownership of the mine is about 60 percent American, 29 percent Australian and 11 percent British.

REPUBLIC OF THE PHILIPPINES—A 220,000-ton per day steel plant may be built by **Santa Ines Steel Company**, following a report by the Salzgitter Industrielle Industriebau, West German steel firm, which has been studying the economic and technical feasibility of the project. The study report recommended the construction of such a plant based on Santa Ines ore deposits, with the LD-process to be used in melting pig-iron to steel. Semi-finished products, ingot moulds and grey cast iron were suggested as products at present.

NORTHERN TERRITORY—**Peko Mines Ltd.** of Tennant Creek has contracted to supply **Sumitomo Shoji Kiasha Ltd.** of Japan with 30,000 tons of copper concentrate (equal to 7,400 tons of refined copper) per year for the next seven years. At the company's Orlando prospect development work continues but difficulties have been encountered that will necessitate much more work before over-all evaluation of extraction rates and milling problems can be considered. Sinking and further drilling are in process to test primary values below the influence of oxidation. The lode structure now exposed over a strike length of 800 feet offers an opportunity for developing worthwhile bodies for extraction.

REPUBLIC OF THE PHILIPPINES—Tonnage treated by **Samar Mining Company** at its **Hope** and **Hijo** mines, Masara project, during April totalled 7,521.32 dry short tons. Copper concentrate produced was estimated at 184.22 dry short tons. Because of improvement in the grade of mill feed, the production volume was more than four times the amount of copper recovered in March. Gold recovery at the Hijo mine increased from 58 to 71 percent.

NEW ZEALAND—Gold mining properties of **South Pacific Mines Ltd.** around the area of Thames on the Coromandel Peninsula have been taken over by **South Seas Mining Company Ltd.** of Toronto, Canada. South Pacific, also a Canadian firm, last year began exploration and development of the property located on the east coast of New Zealand's North Island. The Coromandel Peninsula is the site of many bonanza-type mines which were worked between 1867 and 1910.

WESTERN AUSTRALIA — Financial backing of a treatment plant near Whim Creek, 50 miles east of Roebourne on the northwest coast, is being considered by **Nippon Mining Company of Japan.** The **Whim Creek** mine is one of Western Australia's largest copper mines, but transportation has presented difficulties. The Japanese firm is also reportedly considering a central treatment plant in the Cloncurry Queensland, area, to take the output from a number of small mines. One mine near Cloncurry, already operating a small gravity plant, is said to be producing low-grade concentrate.

NEW GUINEA—**Misima Island-Pacific Mines Ltd.** reports discovery of an extensive lode system which it hopes to bring into production within the next two years. The discovery is referred to as a "virgin gold deposit."

NEW ZEALAND—A five-year geothermal steam investigation program, costing £A1,250,000 is scheduled to start in the coming year, with work mainly at Wairakei, with some at Roturua and elsewhere. Estimated cost of power from the Wairakei station when operating at proposed maximum capacity of 250,000 kilowatts will be lower than that of many hydroelectric stations now being built.

NIGERIA—Extensive drilling at **The Jantar Nigeria Co. Ltd.** has now been completed, with the result that the reserves of recoverable primary columbite are now calculated to be 4,000 tons of proved and 500 tons of possible primary columbite. This compares with the previous figure of 717 tons shown in the report for the year to September 30.

BELGIAN CONGO—The future of mining and other enterprises in the Belgian Congo was still undecided at the end of the second round-table conference at Brussells between native delegates and the Belgian political parties. Very large shareholders in the companies concerned became the property of the native government after the hand-over on June 30. The native delegates have recognized that these shareholdings provide a means for raising funds for capital development. Though this seems to assure future operation of the companies, most of the delegates are young men, some scarcely out of the undergraduate stage, and they have no authority to commit the Congo political leaders. The latter may have ideas of their own about raising money without the sacrifice of valuable assets. One of them, M. Kalonji, head of a faction of the Congolese National Movement, passed through Brussels recently on his return from the United States, where, he said, he was assured technical aid would be available.

UNION OF SOUTH AFRICA—**Anglo-Transvaal Consolidated Investment Company Ltd.**, affiliated with **Virginia Orange Free State Gold Mining Company** and **Merriespruit Orange Free State Mining Company,** is investigating the possibility of an arrangement whereby Virginia would treat ore from the Merriespruit mine where the dewatering program has been discontinued and a small amount of development work has produced no significant results. Gold earnings of the Virginia company declined because grade

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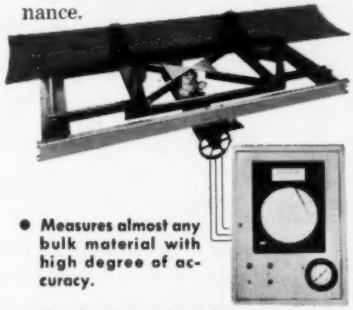

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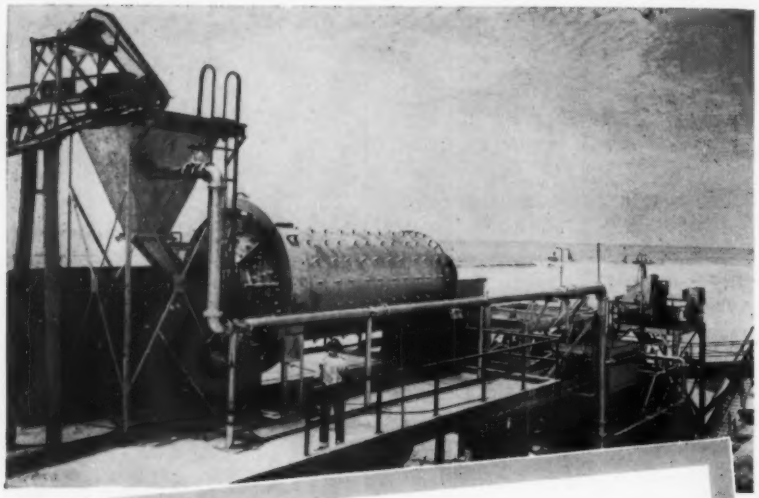

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and payability of the ore has continued to fall. **Kennecott Copper Corporation** of the United States has a substantial interest in both companies.

NIGERIA—**The Bisichi Tin Co.** (Nigeria) **Ltd.** reports that all of its 1960 columbite production and half of that of 1961 has been sold to the United States at better prices than those received last year. In addition, half of the 1962 output has been sold at prices which will prevail at about the time of shipment. As a result of these contracts being placed, columbite output is being stepped up and exploration work is continuing as practically demonstrated by the fact that, since 1956, ore reserves have been increased from 2,090 tons of tin and 950 tons of columbite to 2,628 tons of tin and 5,895 tons of columbite. A further 1,050 tons of proved tin have been added to this as a result of the acquisition of mines belonging to **Nigerian Tin and Exploration.**

GHANA—A further contraction of operations can be expected by **Amalgamated Banket Areas Limited.** The annual report of the company states that output is likely to suffer until new ground can be made available for mining. Work is being concentrated on the promising Abbontiakoon section of the mine. With the aid of the previously announced £450,000 Ghana Government interest-free loan, it is planned to increase development here and rebuild ore reserves during the next three years.

GABON—Three of seven General Electric Diesel-electric locomotives are being delivered soon to **Compagnie Miniere de L'Ogooue** [COMILOG] which plans to start mining a new manganese ore deposit this year. The locomotives will be used in construction of an 18-mile, 42-gauge railroad from a siding of the Congo-Ocean railroad near Dolisie to a cable-way dump site at M'Binda. The 60-mile cableway will haul the ore from the mine to the railroad.

BELGIAN CONGO—The new Luilu copper and cobalt electrolysis plant of **Union Miniere du Haut Katanga** near Kolwezi has started production. Annual capacity in the initial stages will be 50,000 metric tons of copper and 1,750 tons of cobalt. In early 1961 this will be increased to 100,000 tons of copper and 3,500 tons of cobalt per year.

UNION OF SOUTH AFRICA—Exploratory development eastward in the Rietfontein section by **East Daggafontein Mines Ltd.** has indicated satisfactory payability and values on both the Main Reef Leader and Kimberly Reef horizons.

FEDERATION OF RHODESIA & NYASALAND—**Johannesburg Consolidated Investment Company Ltd.** plans to spend about £30,000 during the next two years in prospecting gold, arsenic and antimony deposits in the Harley and Que Que districts of Southern Rhodesia.

UNION OF SOUTH AFRICA—According to the Minister of Mines, over the next 30 years, gold production will have an estimated value of about £7,000,000,000 equivalent to an anual average value about that of 1959, when it was approximately £250,100,000. A report on establishment of a pension plan for mineworkers is under consideration by the Minister, and negotiations for increas-

ing wages in the gold mining industry are under way.

FEDERATION OF RHODESIA & NYASALAND—Annual capacity of the three mines operated by the **Rhodesian Selection Trust** companies will be raised to nearly 300,000 tons of copper yearly. Present capacity of the mines in the copperbelt—**Mulfulira, Roan Antelope,** and **Chibuluma**—is 235,000 tons.

UNION OF SOUTH AFRICA—The maximum density for treating diamonds by heavy media separation is 3.4. In the MINING WORLD, March 1960, article "Why An Atomized Ferrosilicon Proves Superior for Heavy Media Plants" an error was made in reporting that the maximum density was 3.8. Such a high density would not be allowable nor profitable because with this pulp viscosity diamonds would be rejected with the float.

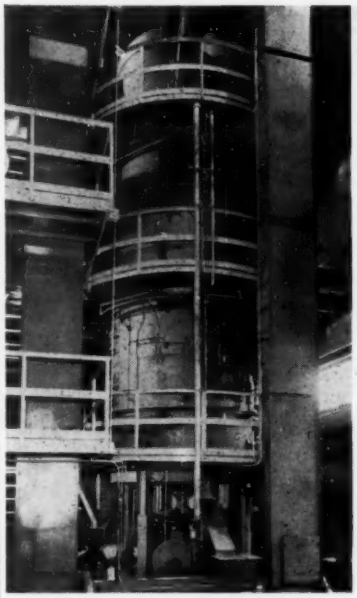
FEDERATION OF RHODESIA & NYASALAND—A new copper mine is expected to be opened up soon in southern Rhodesia on the Shamrock claim 200 miles northeast of Salisbury by **Rand Mines.** The company obtained an exclusive prospecting order a year ago after test drilling indicated ore assaying 2.5 percent copper. Rand is committed to spend at least £130,000, under the order, but plans to invest about twice that amount to cover the cost of 30 drillholes and incidental equipment.

GHANA—A new production record is predicted in the current year to September 30 for **Ashanti Goldfields Corporation,** which plans to increase milling this year from 406,000 to 425,000 tons. Proposed gold output is 346,000 ounces, compared to the previous year's 321,366 ounces. Diamond drilling has proved an extension of the Main Reef ore body down to 43 level. With a depth of 4,200 feet, Ashanti is already the deepest mine in western Africa. At the Ayeinm section, exploration below the 16 level must await deepening of the Ayeinm shaft, scheduled for 1960-61.

UNION OF SOUTH AFRICA—**Minerals Engineering Company (S.A.) Pty. Ltd.** is expected to increase production of vanadium from its Witbank mine and mill. **Anglo-American Corporation of South Africa** is acquiring a controlling interest in the company and will take over technical control of operations in the Transvaal. The South African company was originally jointly owned by **High Speed Steel Alloys Ltd.** of England and various United States interests including **Minerals Engineering Company** of Colorado.

GHANA—A combined airborne magnetometer and radioactivity survey covering two areas totalling 6,600 square miles of Ghana will be undertaken by **Hunting Surveys Ltd.** The areas include most of the gold and manganese mines in the country and are known to be important mineralized zones. Cost of the survey is being shared by the United States International Cooperation Administration and the Ghana government, as part of the second development plan.

UNION OF SOUTH AFRICA—**Hartebeestfontein Gold Mining Company Ltd.** has completed the first stage of converting the existing leach section of its uranium plant to the high-temperature ferric leach process.



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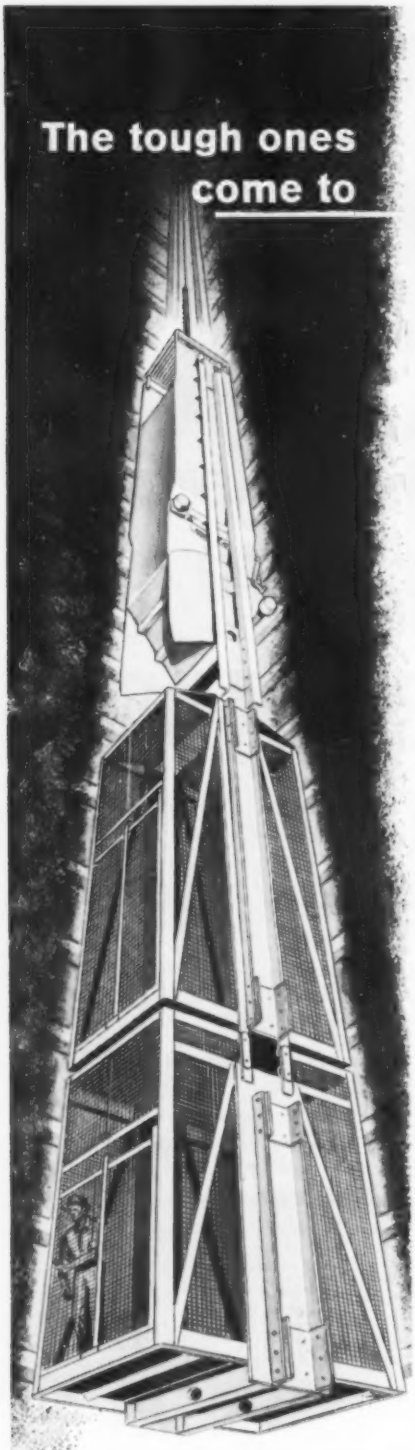

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NORTHWEST TERRITORIES—An exploration program has been started by **Vanguard Explorations** at its gold prospect northeast of Yellowknife, acquired early this year from L. Garskie. Extensive surface sampling will be carried out on the property, with drilling expected to begin later this season. In previous years high grade gold has been obtained from two pits at the property, and over 30 scattered gold showings have been found in an area about 2,000 by 1,000 feet.

ONTARIO—Deep level work at the Christopher property of **Agnico Mines Ltd.** cobalt area silver producer, has indicated new ore, the deepest so far developed on the property. Initial muck samples taken range from 48 to 50 ounces per ton. In a drive at the 740-foot horizon, extended south from the adjoining Silver-Miller Brady Lake property into the Christopher, a length of 46 feet has been opened. Ore occurs in a heavily altered zone which includes a typical calcite vien about four inches wide carrying cobalt and native silver. Hoisting capacity at the mine is being doubled to 200 tons daily, with installation of an electric hoist to replace the former compressed air type. The company is also stepping up development at its O'Brien property where new ore is being opened up at the 150-foot horizon. Grade there is running about 42 ounces per ton.

BRITISH COLUMBIA—Both quantity and grade of ore reserves have shown a considerable increase at the property of **Craigmont Mines Ltd.** near Merritt in the Chapman Valley. Reserves of semi-proven ore are now estimated at 17,043,000 tons grading 2.04 percent copper and 19.8 percent iron. The 3,000-foot level adit has been advanced a total of 4,960 feet from portal, and 10,283 feet of diamond drilling has been completed since March 1.

BRITISH COLUMBIA — Development of the Spokane mine near the southeast end of Kootenay Lake is being continued by **Rimrock Mining Corporation**, which plans to erect a 35-ton mill on the property in the near future. Proven ore blocked out is estimated at 15,000 tons. A drilling program on a 48-claim silver-lead prospect just southwest of Cranbrook is also being continued by the company.

QUEBEC—Deep underground drilling by **Opemiska Copper Mines Ltd.** in a new part of its Chibougamau district property has disclosed what seems to be a new copper zone. At the 1,800-foot horizon there is an indicated length of 300 feet averaging 5.5 percent copper across an average core width of 18.7 feet. Several holes have been drilled and the discovery hole returned an intersection of 24 feet averaging 8.0 percent copper, 0.02 ounces gold and 1.01 ounces silver per ton. A second hole to the east showed 3.37 percent copper, and a third is said to average 3.5 to 4.0 percent copper.

BRITISH COLUMBIA—The **Sullivan** mine at Kimberley yielded 2,440,396 tons

of lead-zinc-silver ore in 1959; the **Bluebell** mine at Riondel, 251,366 tons of lead-zinc ore; the **HB** mine near Salmo, 463,504 tons of zinc-lead ore. The mines are owned by **Consolidated Mining and Smelting Company of Canada, Ltd.**

ONTARIO—Tonnage of ore mined by **International Nickel Company of Canada Ltd.** at its **Sudbury** mines in 1959 was 15,316,000 short tons, up considerably from 1958, but a bit less than in 1957 because operations early in the year were just being resumed after the end of the 1958 strike. Total ore mined during the last half of 1959 was at the rate of 16,500,000 tons yearly. Underground development in operating mines for the year amounted to 66,000 feet for a cumulative total of 2,364,000 feet. At the **Murray** mine, ore shipments were resumed early in the year after operations had been suspended in July 1958. The company also resumed the development and construction program at Crean Hill suspended early in 1958.

BRITISH COLUMBIA—**Cariboo Gold Quartz Mining Co., Ltd.,** is opening a new mine in the Burnett Fault area of its holdings at Wells. Mine production totaled 46,586 tons with a gross value of nearly $600,000 in gold and silver. W. B. Burnett, Vancouver, is president.

QUEBEC—**Canadian Javelin Limited,** which has contracted to explore and develop the **Jack Waite Mining Company** Gensart Lake property in northern Quebec, will supervise a combined aerial electro-magnetic and magnetometer survey in the area. The Hunting Survey Corporation will undertake the aerial investigation. Canadian Javelin, which has extensive iron ore holdings in Labrador and Quebec, recently became the largest shareholder in the Jack Waite firm, which also has mining properties in Montana and Idaho. Previous field work in the Gensart Lake area indicates sulfide mineralization under favorable geological conditions.

ONTARIO—**The Walker Mineralogical Club** has announced its 1960 Peacock Memorial Prize competition, for which it gives a $200 award for the best scientific paper on pure or applied mineralogy, including crystallography, mineralogy, petrology, ore genesis, and geochemistry. Competition is open to any graduate student in a Canadian university, a Canadian graduate student enrolled in any university, or any graduate student on a Canadian subject. Interested authors may write to The Secretary, Walker Mineralogical Club, 100 Queen's Park, Toronto 5, Ontario. Closing date is December 31, 1960. The 1959 Peacock prize was given to Dr. John Gittins, for his paper entitled, "The Petrology of the Nepheline-Bearing Rocks of Glamorgan and Monmouth townships, Ontario, Canada".

BRITISH COLUMBIA—**Basic Incorporated** has recently leased magnesite deposits in this province for further investigation, continuing its policy of seeking to establish further reserves. The firm, which has its headquarters in Cleveland, Ohio, also operates in Nevada.

QUEBEC—Most of the administration and construction personnel of **Quebec Cartier Mining Company** are now living in new townsites located at Port Cartier on the Gulf of St. Lawrence and at Gagnon, 100 miles north. All phases of the iron ore project are progressing, with primary crusher foundations, the conveyor tunnel to the concentrator, and the steel structure of the concentrator already completed. Installation of equipment has started and operation of four mill sections is expected by October, the remaining eight by the start of 1961. Development of the Lac Jeanine pit is on schedule, as is construction on the power project which is expected to start producing in August.

CANADA—**The Consolidated Mines Selection,** one of the mining-finance companies belonging to the Anglo American Corporation's group of companies in Africa is now branching out into Canada through **McIntyre Porcupine Mines** and a new firm, **Locana Mineral Holdings,** which has been chartered in Canada as a channel for British, South Africa, and European capital to take advantage of Canadian mining opportunities. Initial subscribers include **Hambos Bank, The British Empire Investment Trust, British South Africa Company,** the **Cables Investment Trust,** and the **Malayan** and **Tronoh** tin companies.

QUEBEC—**Quebec Iron and Titanium Corporation** expects to treat about 800,000 tons of ore this year, double the amount handled in 1958. Auxiliary facilities under construction at the Sorel Smelter will increase the plant's capacity to 1,000,000 tons by 1961. Owned by **Kennecott Copper Corporation** and **New Jersey Zinc Company,** the company has

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made good progress in reducing costs and in upgrading the iron product for which a market is growing favorably in the United States as a high-grade, low-phosphorous, foundry material. Additional furnaces may be necessary if demand for titanium slag and its Sorelmetal continues present improvement.

BRITISH COLUMBIA—Processing of stockpiled zinc concentrates is under way at the **Reeves MacDonald** mine at Remac in the Salmo area. Production in 1959 totaled 421,593 tons of ore and 32,376 tons of concentrates containing more than 28,500,000 pounds of zinc, 8,800,000 pounds of lead, 160,000 pounds of cadmium and 32,000 ounces of silver for a total net value of $1,713,389. An ore body was found and developed east of the O'Donnell ore body. Shaft sinking was completed from the 1900-foot level to 1,045 feet above sea level and hoisting equipment was installed. Jens Jensen, Spokane, Wash., is president of Reeves MacDonald Mines, Ltd.

ONTARIO—Accomplishments anticipated during 1960 for **Steep Rock Iron Mines Ltd.** include shipping 2,325,000 tons of ore; stripping in the **Hogarth** Pit to permit efficient ore production now and in the future; continued investigation of underground mining methods at the **Errington** mine to determine best possible recovery methods for large-scale production; further dredging and removal of No. 3 dump so development in the "G" zone can be completed in 1961; completion of equipment installation at Hogarth, and establishment of a drainage drift in the footwall to commence lowering the water table in the ore zone.

QUEBEC—**Portage Island (Chibougamau) Mines Ltd.** has outlined 660,000 tons of ore between the 250 to 700 foot levels by its preliminary drilling program, giving sufficient data for the company to start the second stage soon, so that the property will come into production early in 1961. The company started sinking its four-compartment shaft last July. Average grade of the tonnage after dilution is 2.74 percent copper and 0.117 ounces of gold per ton. Estimates include only flat holes, but some angle holes have also been completed. One, at section 30 on the 400-foot level, cut 17 feet averaging 9.838 ounces gold and 1.41 percent copper. Cost of preparing the property for production is estimated at $1,750,000, of which **Patino of Canada Ltd.** and **The Nipissing Mines Company Ltd.** may advance $1,500,000. Ore will be milled by **Copper Rand Chibougamau Mines.**

ONTARIO—The **Strathcona** mine of **Falconbridge Nickel Mines Ltd.** in the Levack area northwest of Sudbury is classified as a major ore body that may produce greater tonnages than any other the company has. Sinking of the first development shaft is getting under way. Although it will take five or six years to get the mine into production, company officials speak of the possibility of bringing the mine in at the rate of 4,000 to 6,000 tons per day. The company's production this year is continuing at the high level of 1959, with output expected to increase by several million pounds. The 1959 total of 58,000,000 pounds was a 20 percent increase over the previous record year of 1958.

BRITISH COLUMBIA—At Bralorne Division of **Bralorne Pioneer Mines Ltd.** development of the 79 vein on the lower levels has continued, although drifting was reduced because of preparation to open up the vein structure as part of the ventilation system. Sinking of the Queen shaft was completed to 60 feet below the 38 level station. Cutting of that station and driving of the 38 level crosscut began prior to developing a large, promising block of 77 vein ore between 35 and 38 levels. Diamond drilling emphasis is on proving continuity of vein structures both horizontally and vertically. At the company's Pioneer Division, work has developed a new, deeper level of ore, with encouraging drift assays. Diamond drilling proved extension of the 27 vein about 1,600 feet vertically below 29 level. Three drill holes from 29 level have cut a new structure, averaging 1.7 feet wide and assaying 0.74 ounces of gold per ton. Exploration plans of the company cover recently optioned Ace holdings, and resuming work on the Snell mercury prospect and a newly acquired gold prospect.

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MEXICO—**The Eagle-Picher Company**, headquartered in Cincinnati, Ohio, has sold part of its Mexican holdings to a local group headed by R. B. Taylor, who recently assumed the presidency of **Minas de Iguala, S.A. de C. V.** Minas de Iguala is presently operating the **Esmeralda** mine at Parral, Chihuahua.

CHILE — Immediate development is planned by **Compania Minera Tamaya** for the copper deposit El Rosarion of Andacollo in the Province of Coquimbo. The copper property, which includes 500 claims, was recently bought by Cia. Minera Tamaya for about $2,000,000 from Luis Zepeda and Joaquin Barrerea. Copper content of the ore is 2 percent and the deposit is 150 feet thick. In the same district, **The Anaconda Copper Company** has taken a three-year option on the **El Sauce** and **Pajonales** gold and copper mines of **Beltran Amenebar C.**

BRAZIL—**St. John d'el Rey**, a British registered mining company operating in Brazil but controlled by American interests has obtained British Treasury consent to transfer control to the United States. The Brazilian gold and iron ore company has announced plans to seek Brazilian nationality and to raise fresh capital.

MEXICO—Detailed estimates of Mexico's barite reserves are being prepared by government geologists. First region to be surveyed was Galeana, Nuevo Leon, where an estimated 150,000 tons of proven reserves is located. A survey of the state of Coahuila is now under way.

ARGENTINA—A contract for development of the **Sierra Grande** iron ore deposits has been awarded to **Cia. Minera**

INTERNATIONAL

Alumine S.A.I.C.F. and the **Southern Cross Steel & Mining Company** by the Argentine secretary of war.

MEXICO—Government geologists have located new copper deposits near La Verde, Michoacan. To date, an ore body covering 25 square kilometers and containing 5,000,000 metric tons of 1.75 percent ore has been outlined.

CHILE—Havoc created by the recent earthquakes necessitating the utmost in national cooperation was a factor in ending the 3½-week strike at the Potrerillos smelter and **El Salvador** mine of **The Anaconda Company**. The agreement, reached May 26, calls for a 51 percent wage increase and a new 15-month contract. The size of the increase represents a compromise between union demands of about 60 percent and the initial company offer of about 50 percent. Increase after the first year amounting to 50 percent of any increases in living costs are also provided in the new contract.

PERU—A development program for sulphur in the slope of the Tutupaca volcano in Canadarave, Tacna, and the Ticasani volcano in Cuchubay and Carumas, Moquegua is planned by **Cia Minera Raytex, S. A.** The company has also located an iron deposit at Inuma hill, district and province of Tarata in Tacna.

MEXICO—Construction of a phosphorous plant—the first of its kind in Mexico—has been started in Saltillo, by the Hooker mining interests. The mill will process ores from Hooker mines in the states of Zacatecas, Coahuila and Nueva Leon.

BRAZIL—A mill for production of columbium concentrates will be built in Brazil by **Molybdenum Corporation of America** and **Wah Chang Corporation**. Construction is to begin immediately, with completion scheduled in about a year. Ore will be mined from a new Brazilian columbium deposit controlled by the two United States firms. Although size and cost of the mill have not been announced, the companies said it would be larger than orginally planned because of the existing and anticipated substantial demand for columbium which is finding increased use in steel production and in atomic and high temperature applications.

PERU—Exploration by **Cerro de Pasco Corporation** on its optioned Cobriza property 115 miles southeast of La Aroya has indicated presence of copper of commercial quality and grade. The company is carrying out surface geology and drifting on the property located within the "great bend" of the Mantaro river known as the Peninsula de Tayacaja, between Huancayo and Ayuchucho. To reach the site, where a 50-man crew is at work, the corporation built a 15-kilometer road from Coris. Cerro de Pasco has resumed surface mining of copper ore in the McCune pit after it was suspended in December, 1957 for economic reasons. The firm's plant modernization project during 1959 included a new crushing, grinding and charge preparation section of the lead sinter plant, a new sinter machine, improved materials handling and other features designed to reduce lead smelting costs. The smelter now has a capacity of 200,000,000 pounds of lead bullion annually. Lead refining capacity, now rated at 170,000,000 pounds per year, can be readily increased when conditions warrant. Total metal production for Cerro for

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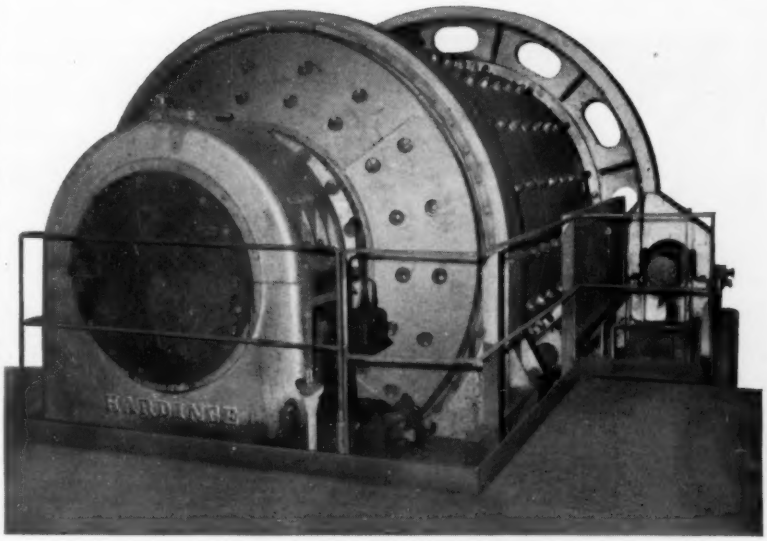

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its 1959 Peruvian operations was 73,766,000 pounds of copper; 71,797,000 pounds of lead; 59,189,000 pounds of zinc; 12,135,000 ounces of silver, and 36,000 ounces of gold.

MEXICO—Still the world's leading silver producer, Mexico in 1959 produced 22.1 percent of the world's total output.

VENEZUELA—An 11.2 percent increase in iron ore production over the previous year was attained in Venezuela for 1959, with a total of 17,403,545 metric tons. **The Orinoco Mining Company (U. S. Steel)** accounted for 14,658,288 tons or 84.2 percent of the total, while the **Iron Mines Company of Venezuela (Bethlehem)** produced the balance of 2,745.257 metric tons. Exports increased 8.16 percent over the year before, with 80 percent of the total of 16.915,877 metric tons going to the United States.

BRAZIL—**Molybdenum Corporation of America**, in its joint venture with another United States company, has developed its Brazilian columbium property by extensive tunneling. Work to date shows a very large tonnage of ore grading over 3½ percent columbium oxide. Plans call for mining by open pit and construction of a 200-ton capacity mill soon. The ore concentrates easily and production costs are expected to be low. Construction time for the plant is estimated at one year.

CHILE—A near-record amount of ore was mined and milled by **Braden Copper Company**, Chilean division of **Kennecott Copper Corporation**, last year in spite of the one-month strike in October. Favorable climatic conditions increased the amount of hydroelectric power available for operations, and mining efficiency measures increased output per worker shift. Although the copper content of the ore mined declined, improved concentrating equipment enabled the firm to recover the same amount of copper per ton as in the previous year. Most of the company's output went to Europe, the major portion shipped direct in the form of blister and fire-refined copper. A lesser amount of blister was electrolyzed in United States refineries for delivery to Europe.

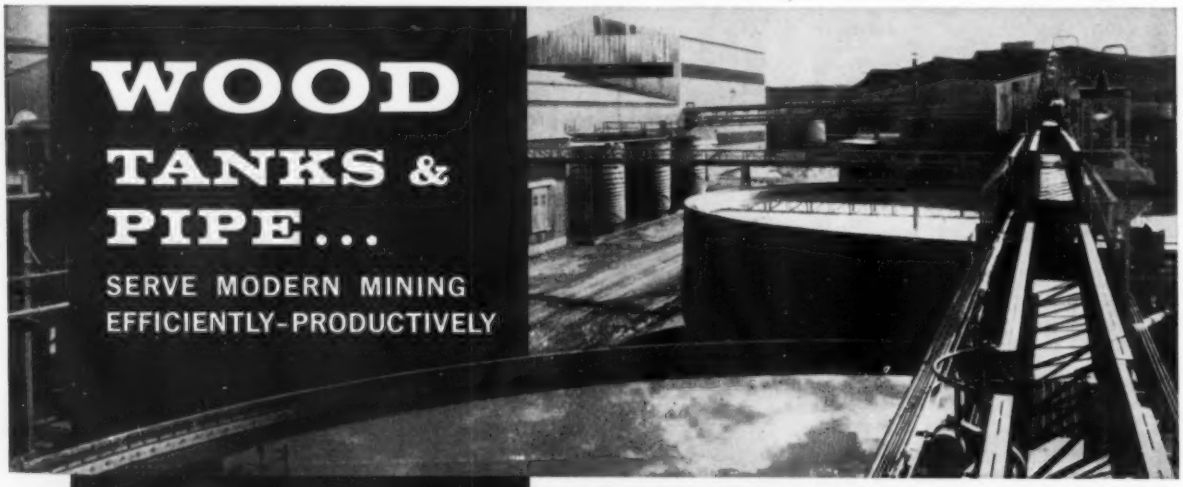
INDIA—**Aluminium Industries Ltd. (ALIND)** has trebled its output at Hirakud within 13 months of starting operations at its plant. The company's second casting and rolling mill was formally opened by the Chief Minister of Orissa recently. India's largest manufacturer of aluminium conductors, the company now has an annual capacity of 10,000 tons of electrolytic aluminum rod and 13,000 tons of conductor. The rod mill, second of its kind east of the Suez, uses a patented Italian process which requires no billet-casting and no pre-heating.

SYRIA—About £S 20,000,000 has been allocated by the Syrian government for mineral projects in the country during the current five-year development plan. Eighteen specific projects are planned, including a complete geographical and topographical exploration program, and intensified prospecting for iron, copper, chrome, magnesium and phosphate.

MALAYA—Iron ore production totaled 1,106,042 long tons during this year's first quarter, up 477,100 tons over 1959's first period. Output from Trenggau, Malaya's top iron-producing state, totaled 245,600 tons in the quarter. Bauxite production for the country totaled 11,731 tons in the first period; ilmenite output was 38,282 tons, and columbite, 22 tons.

THAILAND—Field Marshal Sarit Thanarat, prime minister, has announced that no more mining leases will be issued to foreigners and that Thailanders will be given all necessary assistance to operate the country's mines. The prime minister, who is also commander in chief of the armed forces and chief of police, recently made an inspection trip to the southern mining provinces of Thailand.

INDIA—Reserves of about 1,500,000 tons of fluorite have been indicated at a deposit at Mandua-Ki-Pal in the Dungarpur district of Rajasthan State. New deposits of atomic minerals have also been located in various parts of India.



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Monazite sand, previously located only on the Kerala coast, has now been found near Ranchi in Bihar, Puralia and Bankura in West Bengal, and Kurnol in Andhra. Uranium mines are being developed in Bihar and Rajasthan, in the hope that enough uranium will be available to supply the nation's first nuclear power station.

TURKEY—To supply raw material necessary for a second steel industry being established here, the Mineral Resarch and Exploration Institute of Turkey (MTA) is accelerating exploration for iron ore. Iron deposits of interest have been located recently north of Malatya near the village of Hasancelebi, and are situated on both sides of a railroad line which goes to the port of Iskender on the Mediterranean. The deposit of Hasancelebi-East consists of limonite and dehydrated limonite, with a visible reserve of some 12,000,000 tons, averaging about 50 percent Fe, with about 4 percent Mn. In the Hasancelebi-West deposit there are several sheet-like ore bodies. The ore consists of magnetite-hematite, with the medium grade approximately 54 percent Fe. An extensive drilling program is now under way. Visible ore presently is estimated at 9,000,000 tons, which could be mined by open-pit methods.

MALAYA—**Sungei Kinta Tin Dredging Ltd.** has closed its dredge pending a decision on whether to switch to open-pit mining operation because of higher costs resulting from the heavy duty on fuel oil, and also because the dredge has entered lower-grade ground. The company, which mines property on the outskirts of Ipoh, Malaya's tin-mining capital, sold 27½ tons of tin ore during the last quarter, a little over half that of the previous quarter.

INDIA—**The Indian Copper Corporation** will build an electrolytic copper plant, with a capacity of 8,000 tons per year, at Ghatsila.

MALAYA—There has been a rush for iron ore concessions in the Kedah Peak area where geologists had earlier reported rich deposits. Seven local concerns are prospecting in the district on lots ranging from 500 to 3,000 acres. Almost all the land in the area is a Malay reservation but it is possible that the Kedah state government will change this to give priority to iron ore mining.

INDIA—Reserves of iron ore in the Thirthamalai area of Salem district are estimated at 47,500,000 tons, with the ore consisting mainly of magnetite with an average Fe content of 35 to 40 percent. Mining of the ore for use in pig iron production depends on the outcome of pilot scale experiments at the low shaft furnace of the National Metallurgical Laboratory in Jamshedpur.

MALAYA—**Lingui Tin Ltd.**, which had to close its two mines in South Johore in 1951 under the emergency laws because of armed Communist terrorism, has resumed mining now that the Kota Tinggi district of Johore has been declared a "White Area", freed of all emergency laws. The land leased by the company is thought to contain valuable ore deposits and may be suitable for dredging.

INDIA — The century-old diamond mines of **Panna** in Madhya Pradesh will be nationalized soon, with operation by the National Development Corporation of India. Initial plans call for prospecting a 45-square mile area which is known to contain four diamond pipes. A survey covering 750 miles of the area by Russian experts indicates diamondiferrous ground amounting to about 4,000,000 tons. The Soviet experts recommended mechanization of the mines at a cost of Rs50,-000,000.

IRAN—**The Chromite Company Ltd.** is developing a recently discovered chromite deposit east of Shiraz. Research for construction of a concentrator is being undertaken by WEDAG in West Germany.

KOREA—More surveys of mineral resources, modernization of mining facilities with government subsidies and loans, establishment of ore dressing facilities for common use, and surveys of overseas markets are some of the measures the Ministry of Commerce and Industry plans to increase exportation of minerals.

MALAYA—Japanese steel mills have signed contracts with Malaya's iron ore producers for a record M$145,000,000 worth of iron ore during the 1960 fiscal year. About 4,750,000 tons of ore will be delivered, compared with 3,950,000 tons worth M$120,000,000 in the fiscal year ended last March 31.

CYPRUS—**Cyprus Asbestos Mines Ltd.** produced 14,412 short tons of fiber in 1959, compared with 16,409 short tons the year before, although the amount of ore treated was greater—1,443,314 tons in 1959 and 1,409,133 in 1958. Exports through the port of Limassol were mainly to Denmark, Sweden, United Kingdom, Thailand, and Czechoslovakia. The company's leased area is on Troodos Mountain, with plans and offices at Amiandos in the same area. An associated company, **Cyprus Cement Company Ltd.**, mines marls and limestone from quarries close to Moni, near Limassol. Last year this company used 3,000 tons of iron slag from ancient Roman workings in the Kalavassos area.

INDIA — The government's National Industrial Development Corporation, through a new subsidiary company, plans a project to produce sulphur, sulphuric acid, and other products from pyrite deposits in the Amjor area of Behar State. Initial capacity of the project will be 200 to 300 tons of sulphur per day.

TURKEY—Several thousand tons of ore are expected to be produced this year from a manganese deposit in the Arvin district of northeastern Turkey. Reserves of ore, which has a 48 percent Mn content, low silica and Fe, are considered large, by Turkish standards. Lack of financing prevents full development at present.

MALAYA—Perak is now Malaya's second largest producer of iron ore, producing 615,238 long tons last year, while Trengganu, the leading state, had an output of 2,116,200 tons. Up to seven years ago, there was no iron mining in Perak. One mine opened in 1953 and produced 9,000 tons of ore. The state now has seven iron mines.

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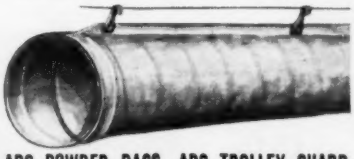

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Russian Engineers Inspect Drill Jumbo in Britain

Russian mining engineers in Great Britain recently watched field trials for a drilling machine, the first of 15 such ordered for use in Russian mining. Pictured here at a Derbyshire quarry are two engineers from the USSR Trade Delegation with British representatives of F. Taylor and Sons and the Holman Group, suppliers of the £250,-000 mining equipment. From left to right are E. W. Hurd of F. Taylor and Sons; J. O. H. Muhlhaus of the Holman Group; D. M. Barskov of Russia; W. B. Rainbird of the Holman Group, and V. Gorbatsevitch of Russia. The drill jumbo in the background is fitted with four Holman drifters on power feed sashes and supported by hydraulic booms. Drills are controlled by two men on a platform above the tower assembly, shown here in its retracted position.

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TURKEY—An aerial survey covering about 100,000 square miles of promising mineral country has been undertaken by **Canadian Aero Survey Ltd.**, for the Mineral Research and Exploration Institute of Turkey, which is accelerating iron ore exploration in the country. The project is financed by the Development Loan Fund of the United States, which granted a $900,000 loan last year for the purpose. Both magnetic and scintillometric methods are being used in the survey, which is based on previous geological, geophysical and mining data acquired by the Institute. The areas being surveyed are contained in three large sections, at the eastern, western and central parts of Turkey. Interesting magnetic and radiometric anomalies have been detected and are being followed up.

MALAYA—**Mitsubishi Shoji Kaisha Ltd.** of Japan has opened a mining department in Singapore to provide prospecting services for Malaya's iron ore industry. The first is now prospecting in the Johore Bahru district, and plans to open a research laboratory in Singapore or in Kuala Lumpur.

INDIA—A substantial expansion of its bauxite, alumina, aluminum ingot, rolling mill and extrusion facilities costing $17,-000,000 is planned by **Indian Aluminium Company Ltd.**, subsidiary of the **Aluminium Ltd. of Canada.** Principal phase of the project will be to double the primary ingot capacity of the company's smelter at Kirakud in Orissa to 22,400 tons per year. The reduction plant was opened early in 1959.

MALAYA—According to **The Kulim Rubber Plantation,** potentially valuable iron ore deposits have been located in the Kulim district of Kedah State. A firm of mining engineers has been engaged and on their advice an option agreement has been signed with a Chinese mining concern to prospect an area of about 500 acres.

EUROPE

FINLAND—**Rautaruukki Oy** has announced plans to build a complete steel plant in Finland. Helge Haavisto of Helsinki is director general of the new company.

NORWAY—**Norske Sing og Blygruber A/S,** lead and zinc producer, will start mining soon at the **Mofjellet** ore reserves. Initial tonnage of 70,000 will be increased to 92,000 tons by 1962. The company also plans to produce about 107,000 tons of ore at its **Bleivassli** mines this year. The firm's entire year's output of zinc, lead and copper concentrate has already been sold, but sales of sulphur pyrites are not yet satisfactory.

RUSSIA—Mining operations have begun in the extensive iron ore deposit which lies between Kursk and Belograd north of Kharkov. Preliminary work included sinking a ring of wells and use of dredging machinery to pump out water from a 300-foot thick layer of quicksand. Reportedly the deposit contains 20,000,-000 tons of ore with an iron content of 45 to 65 percent.

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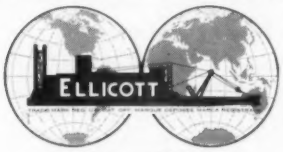

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INTERNATIONAL

YUGOSLAVIA—An increase in production to an annual tonnage of 2,300,000 is planned at the **Vares** iron mine in Bosnia, which now produces 1,300,000 tons of medium grade iron that is used in the company's steel plant or the Zenica steel works. Plans under consideration to upgrade the ore include a beneficiation plant to reduce silica content, using heavy media separation and/or magnetizing roasting methods. The Vares steel plant produces pig iron for other plants, as well as cast iron tubing, fitting and ingot molds.

SWEDEN—Iron ore exports from Sweden during 1959 totalled 15,461,000 tons, compared with 14,810,000 in 1958. **LKAB** accounted for 81 percent of the total, with 13,000,000 tons going mainly to Western Germany, Belgium-Luxembourg, and England.

UNITED KINGDOM—**Skinningrove Iron Company Ltd.** will build an iron ore sintering and materials handling plant at its Carlin How, Yorkshire, works. Head Wrightson Iron and Steel Works Engineering Ltd. will design and construct the £700,000 plant to have an ultimate capacity of 7,000 tons per week of self-fluxing blast furnace sinter produced from a mixture of imported and home ore fines. Similar to a larger plant being built at the Clyde Iron Works of Messrs. Colvilles Ltd., it will include equipment for feeding and controlling automatically the proportions of raw materials, limestone handling equipment, a coke grinding mill, a continuous sintering machine with all ancillaries, a forced draught sinter cooler, and conveying equipment both for raw materials and for delivery of sinter to the blast furnace bunkers.

SWEDEN—At the **Renstromsgruvan** mine of **Boliden Mining Company** a shaft has been sunk from the 450 meter level to the 640-meter level.

YUGOSLAVIA—In Kosovo and Metohija in southern Serbia, deposits of magnesium, chromium, iron and manganese ore, and asbestos have been located during exploration for cobalt. Most important is the location of manganese in Novo Brdo where reserves are estimated at over 200,000 tons of ore with a content of 22 percent pure metal.

SPAIN—One of the highest production figures since 1940 was achieved last year in Viscaya province which produced 1,300,000 tons of iron ore. Contracts for nearly 700,000 tons of ore from the Coto Wagner operation in Leon have been signed, and an export total of 1,000,000 tons is hoped for with the addition of new harbor loading facilities. About 25,000 tons of ore was shipped to Kloeckner Duisburg from Huelva, Cartagena and Santander during six weeks in April and May. Most of this ore was produced by **Mancomunidad Minas Cehegin.**

ITALY—An iron and steel plant costing over 3,000,000 lira will be built at Cornino di Custonaci near Trapani by the newly formed **Siderurgica Generale.** German capital is reportedly behind the project.

YUGOSLAVIA—Production of iron ore, lead-zinc, bauxite, and antimony all increased during the last year, while that of copper, manganese and chromium decreased. Total production for iron was 2,095,000 tons; lead-zinc 1,831,000; bauxite 815,000 tons and antimony 96,138 tons. Copper output was 2,228,000 tons; manganese, 8,084 tons and chromium 107,016, tons.

SWEDEN—**Boliden Mining Company** will start a new 58-meter head frame soon at its mine in Riddahytttan. A crushing and sorting plant, as well as a concentration plant are also planned. At the company's Vassbo mine, tests have been conducted on the stone milling method, in a mill with 6.35-meter diameter and a capacity of 21 tons per hour. Although the building costs are higher for stone milling, the method is more economical.

YUGOSLAVIA—Increased production of lead and zinc last year was attained by the **Trepca** mines, which exported two-thirds of the output to the United States. Production of alloyed lead also improved, with 2,600 tons exported to electric cable factories in West Germany. Another 1,800 tons of antimony-lead were purchased by European countries. Zinc concentrate, amounting to 13,000 tons, was exported to the United States, Germany, France and the Netherlands, while most of the pyrite concentrate, 35,000 tons, went to Poland. The Trepca mines also produce secondary products, principally silver, of which 65 tons was exported, and bismuth, with 70 tons exported.

SWEDEN—**LKAB** will reopen its **Zenobia** mine, the northern part of the Kirunavaara deposit, this summer, expecting to produce 9,500,000 tons from the 30 to the 90-meter level between now and 1966.

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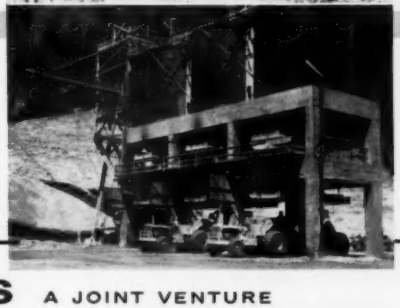

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Index of Advertisers In Mining World

**Asterisk indicates firms whose products are catalogued in* MINING WORLD's *1960 Catalog, Survey & Directory Number*

A

★Alloy Steel and Metals Co. 72
★American Brattice Cloth Corp. 75
★American Cyanamid Co. 16
★American Manganese Steel Div. 18-19
★American Zinc Sales Co. 64
★Atlas Copco 1

B

★Babcock and Wilcox Company 22-23
★Baldwin-Lima-Hamilton Corp. 21
★Boyles Bros. Drilling Co. Ltd. 4
★Boyles Bros. Drilling Co. 77
★Brunner & Lay Inc. 71
★Bunker Hill Company 64

C

★Card Iron Works, C. S. 70
Caterpillar Tractor Co. 2, 52
★Coast Mfg. Co. 76
★Colorado Fuel & Iron Corp. 8

D

★Deister Concentrator Co., Inc. 61
★Denver Equipment Co. .. Inside Back Cover

E

★Ellicott Machine Corp. 77
★Equipment Engineers, Inc. 56
★Euclid Division, General Motors Corp. . 46

F

★Fluor Products Co., Santa Fe Tank Div. 74

G

★Gardner-Denver Company 12

H

★Hardinge Company, Inc. 73
★Harnischfeger Corporation 10-11
★Hughes Tool Co. 17

I

★Industrial Physics and Electronics Co. . 67
★Inspiration Consolidated Copper Co. .. 54
★International Harvester Co. 14-15
International Nickel Co., Inc. 24
International Smelting & Refining Co. 54

K

★Keeney Co., Paul E. 48

M

★Magma Copper Co. 64
★Mine & Smelter Supply Co. 68, 69

N

★National Malleable & Steel Castings Co. 6
★Nordberg Mfg. Co. 13

R

Roebling's Sons, John A. 25

S

★Standard Steel Corp. 63
★Stearns-Roger Mfg. Co. 26
★Stoody Company 66
★Sturtevant Mill Company 3

T

Timken Roller Bearing Co. 9
★Traylor Engineering & Mfg., Div. of Fuller Co. 55
★Tyler Company, The W. S. 20

W

★Western Machinery Co. . Inside Front Cover
★Western Precipitation Corp. 53
★Wilfley Pump Co. .... Outside Back Cover

MARKET PLACE

Darion 80
Federal Tank and Pipe Co. 82
Fisher Contracting Co. 78
Heiner Equipment & Supply Co. 82
Machinery Center Inc. 80
Machinery Reserve of Denver 80
Morse Bros. Machinery Co. 78
Perry Equipment Corp. 78
Pressey and Son 78
Smith, Paul F. 79
Trinity Dam Contractors 79
Wade, W. R. 80

PROFESSIONAL DIRECTORY

★Arizona Testing Laboratories 81
★Bennett's Chemical Laboratory, Inc. .. 81
★Burbridge-Pyburn 81
★Cannon Associates, Harry B. 82
★Chapman, Wood & Griswold 81
★Colorado Assaying Co. 81
★Cooke, Everett & Associates 82
★Cowin & Co. 81
★Diamond Drill Contracting Co. 81
★Dickinson Laboratories, Inc. 81
★Hanks, Inc. Abbot A. 82
★Keegel, C. P. 81
★Kellogg Exploration Co. 81
★Longyear Co., E. J. 82
★Lottridge-Thomas & Assoc. 81
★Merril W. MacAfee 81
★McClintock Co., R. S. 81
★Mesabi Engineering 81
Newman, George H. 82
★O'Donnell & Schmidt 81
★Reed Engineering 81
★Rice, Neil A. 81
★Still & Still 81
★Turner & Associates 81
★Vaughan Diamond Drilling 81
★Whalen, J. F. 81
★Wisser & Cox 81
★Wood Assaying Co., Henry E. 81
★Wolfe & Associates 81

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